University of Alberta

# Stage-Matched Versus Mismatched Exercise Intervention

by

Kari Papke

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## Abstract

The purpose of the present study was to examine whether individuals who received a stage-matched exercise intervention (i.e., tailored to the individual's stage) were more likely to progress in stage compared to those receiving a stage-mismatched intervention (i.e., matched to a different stage) or no intervention (i.e., control condition). In addition, the present study also examined vigorous exercise behavior, and the hypothesized mediators of change, as proposed by the transtheoretical model of behavioral change (TTM). Participants were 293 undergraduate students in the precontemplation/ contemplation or preparation stages for vigorous exercise who were randomly assigned to a stage-matched, mismatched, or control condition. Repeated-measures ANOVAs indicated stage progression in all three conditions. However, the experiment was unsuccessful in differentially manipulating the processes of change based on "stage-matched" and "stage-mismatched" interventions. Changes in cognitive mediators resulted in stage progression; therefore, support for the TTM was indicated.

University of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommended to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Stage-Matched Versus Mismatched Exercise Intervention submitted by Kari Papke in partial fulfillment of the requirements for the degree of Master of Arts.

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# Chapter 1

## Introduction

The role of physical activity as a major contributor to health and well being has been well established; however, physical activity levels continue to be low (King, Blair, Dishman, Dubbert et al., 1992). Insufficient participation in regular moderate exercise is known to shorten life span, increase morbidity, undermine quality of life and general well-being (Bouchard, Shephard, & Stephens, 1994), and is recognised as an important risk factor for cardiovascular disease and cancer (Blair, Kohl, Paffenbarger, Clark, Cooper, & Gibbons, 1989). Participation in regular exercise may provide protective benefits for non-jnsulin dependent diabetes mellitus, obesity, colon cancer, breast cancer, and osteoporosis among postmenopausal women (Marcus, King, Clark, Pinto, & Bock, 1996). Additionally, psychological benefits from regular exercise include improvements in levels of anxiety, depression, and self-esteem (Marcus, King et al., 1996).

Despite these known benefits only 10% of the North American population exercise regularly (Stephens & Caspersen, 1993). According to the American College of Sports Medicine 1990 guidelines, regular exercise is defined as that which lasts for 20 minutes or more at 60 to 80% of maximum heart rate for 3 or more days per week. Furthermore, it is estimated that approximately 50% of individuals who begin a structured exercise program drop out within the first 6 months (Dishman, 1988). Typically, exercise programs are designed for individuals who have high motivation to participate in regular exercise (Stephens, 1987). As a result, a large proportion of the population who are inactive (especially those who have not expressed an interest in exercise) and irregularly active are not being offered exercise programs or interventions tailored to their readiness

and intentions to change (Marcus, Emmons, Simkin-Silverman, Linnan, Taylor et al., 1998; Marcus & Simkin, 1994; Clarke & Eves, 1997).

An intervention is a set of targeted activities designed to encourage increased physical activity in a population (King et al., 1992). Various interventions have been applied to exercise behavior such as reinforcement, self-monitoring, behavioral contracting, stimulus control, goal setting, and health-risk appraisal (Dishman, 1991; Nigg, Courneya, & Estabrooks, 1997). The results have been generally positive; however, they are modest with standardized effect sizes typically ranging from .15 to .20 (Dishman, 1994). As participation rates in regular exercise remain low, researchers must strive to develop more effective tools and interventions that encourage exercise adoption and adherence.

One approach that is receiving increased attention is the development of stage-matched interventions based on the transtheoretical model of behavioral change. It has been suggested that programs designed for people who are ready to participate in regular exercise may not be successful when applied to people who are only considering adopting exercise (Pinto & Marcus, 1995; Marcus, Simkin, Rossi, & Pinto, 1996; Weinstein, Lyon, Sandman, & Cuite, 1998a). In the exercise domain, interventions matched to an individual's stage of readiness to change have been shown to be superior to standard interventions for exercise promotion in worksite and community samples (e.g., Marcus, Banspach, Lefebvre, Rossi, Carleton, et al., 1992; Marcus et al., 1998). These results suggest that further examination of the effectiveness of stage-matching is warranted in an effort to help people initiate exercise and facilitate their progression toward adherence to regular exercise.

Transtheoretical Model

Dynamic theoretical models are being used increasingly to design intervention programs to change problem behaviors. One of the most popular and widely researched stage models is the transtheoretical model of behavioral change. The transtheoretical model (TTM) was proposed initially by Prochaska and DiClemente (1983) as a general model of intentional behavior change. The model focuses on the dynamic nature of change and thus views behavior change as a process involving progress through a series of stages. Sonstroem initially applied the TTM to the exercise domain in 1988. Since that time, numerous empirical studies have supported the stage of change construct across different age groups, cultures, medical conditions, residential locations, sexes, and worksite groups (see Appendix A for an empirical study summary table).

Stage of change is the central construct of the transtheoretical model. The stages of change have been labeled: precontemplation (not intending to make changes in their behavior in the next 6 months); contemplation (intending to change in the next 6 months); preparation (intending to take action in the near future, usually the next month and has attempted to make some small changes toward the desired behavior); action (actively engaged in the new behavior in the past 6 months); and maintenance (sustaining the new behavior over time, for 6 months to 5 years). Movement through the stages has been hypothesized to occur in a cyclical rather than linear pattern, where individuals may make many attempts at behavior change before reaching the final stage (Prochaska, DiClemente, & Norcross, 1992). It has been suggested (DiClemente, Prochaska, Fairhurst, Velicer, Velasquez, et al., 1991) that those individuals who do regress to earlier

stages learn from their previous attempts, and may be better prepared to attempt subsequent behavior change.

Stage theories not only attempt to classify individuals into stages, but also attempt to identify processes which facilitate movement between the stages (Prochaska & Velicer, 1997). Processes of change are defined as the covert and overt activities that individuals employ to modify their experiences and environment to change behavior (Prochaska et al., 1992; Prochaska & Marcus, 1994). A brief description of each of the 10 processes of change is provided in Table 1-1. The processes are divided into two higher-order constructs representing experiential and behavioral processes of change. The experiential processes focus on internal experiences (e.g., thoughts, feelings, or knowledge about the behavior) and include consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation. Whereas behavioral processes focus more on overt activities aimed at modifying the target behavior such as counter conditioning, helping relationships, reinforcement management, stimulus control, and self-liberation.

Studies have shown that individuals in different stages utilize the processes of change in significantly different ways (see Appendix A). Table 1-2 demonstrates the integrated relationship between the processes and stages of change. In the case of exercise, the experiential processes have been found to increase in use from precontemplation to contemplation, and again from preparation to action, at which point they decrease from action to maintenance. The behavioral processes have been found to increase in use from precontemplation to action, where they then level off through maintenance (Prochaska & Marcus, 1994). Consequently, the integration of the stages and processes of change provide meaningful direction for the development of

Table 1-1

Definitions of the Processes of Change.

| Process | Definition |
|---|---|
| Consciousness Raising | Efforts by the individual to seek new information and to gain understanding and feedback about the problem behavior. |
| Counter Conditioning | Substitution of alternative behaviors for the problem behavior. |
| Dramatic Relief | Affective aspects of change, often involving intense emotional experiences related to the problem behavior. |
| Environmental Reevaluation | Consideration and assessment of how the problem effects the physical and social environments. |
| Helping Relationships | Trusting, accepting and utilizing the support of caring others during attempts to change behaviors. |
| Reinforcement Management | Changing the contingencies that control or maintain the problem behavior. |
| Self-Liberation | The individual's choice and commitment to change the problem behavior, including the belief that one can change. |
| Self - Reevaluation | Emotional and cognitive reappraisal of values by the individual with respect to the problem behavior. |
| Social Liberation | Awareness, availability and acceptance by the individual of alternative, problem-free lifestyles in society. |
| Stimulus Control | Control of situations and other causes which trigger the problem behavior. |

(Marcus, Banspach, Lefebure, Rossi, Carleton et al., 1992, p. 425; Marcus, Rossi, Selby, Niaura, & Abrams, 1992, p. 387).

Table 1-2

Matching Processes to Stages of Change

| Precontemplation | Contemplation | Preparation | Action | Maintenance |
|---|---|---|---|---|
| Consciousness raising | | | | |
| Dramatic relief | | | | |
| Environmental reevaluation | | | | |
| | Self-reevaluation | | | |
| | Social-liberation | | | |
| | | Self-liberation | | |
| | | | Reinforcement management | |
| | | | Helping relationships | |
| | | | Counter conditioning | |
| | | | Stimulus control | |

(Prochaska, DiClemente & Norcross, 1992, p.1109)

intervention programs (Marcus et al., 1998; Prochaska, DiClemente, Velicer, & Rossi, 1993).

In addition to the stage and process of change constructs, the TTM has come to include self-efficacy and decisional balance components (DiClemente et al., 1991). Self-efficacy refers to one's belief about his/her abilities to perform a behavior required to reach a certain goal (Bandura, 1982). Self-efficacy has been supported in the literature as an important determinant of exercise behavior change (see Appendix A).

Decisional Balance is based on the model of decision-making proposed by Janis and Mann (1977) in which the pros (i.e., benefits) and cons (i.e., costs) of a behavior are thought to be important in the decision-making process and consequently, in behavior change. Findings indicate that individual stages of change can be distinguished by decisional balance indices (see Appendix A). In the precontemplation stage, the cons always outweigh the pros. In the action and maintenance stages, the pros outweigh the

cons. Therefore, the crossover (i.e., the point where the pros and cons are approximately equal) takes place in either the contemplation or preparation stage (Prochaska, Velicer, Goldstein, Marcus, Rakowski et al., 1994).

Courneya, Nigg, & Estabrooks (1998) suggest that self-efficacy and decisional balance constructs aid in the comprehension of the cognitive aspects of behavioral change, and therefore can be viewed as the *why* of behavior change. The process of change construct can be viewed as an attempt to explain *how* people change their behaviors. Finally, the stage of change construct describes *when* meaningful health behavior change has occurred (Prochaska et al., 1992).

Theories and models of health behavior are often utilized in the design of health promotion interventions (Calfas, Sallis, Oldenburg, & Ffrench, 1997). Because individuals at different stages of readiness to change are believed to respond to different intervention approaches, the development of stage-matched interventions is receiving increased attention across various health behaviors (see Appendix B). Six empirical studies have been published examining the effectiveness of stage-matching in the exercise domain (see Appendix C).

Marcus, Banspach et al. (1992) examined the use of the stage of change model to design an exercise intervention for six hundred and ten adult community volunteers. The *Imagine Action* campaign was a six-week intervention program designed to encourage participants to initiate or increase physical activity. Current stage of change for exercise adoption was assessed at baseline. Participants were placed into contemplation, preparation, or action stages. They were then mailed stage-specific written materials and a resource manual describing community activity options and information about

organized activity nights. Individuals in contemplation received a package focusing on increasing lifestyle activity, the costs and benefits of increasing activity, the social benefits of activity, goal-setting, and reinforcement management. The preparation package discussed the costs and benefits of physical activity, goal-setting, reinforcement management, time management, and details on developing a walking program. The action package included information on exercise relapse prevention, goal-setting, reinforcement management, cross-training, avoiding injury, and cultivating exercise partners.

Follow-up consisted of a telephone interview (n = 236) with questions pertaining to the individual's exercise status and behavior over the past six weeks, and demographic information. Results indicated that participants were significantly more active after the intervention, with 62% of participants in contemplation and 61% in preparation increasing their level of activity. The quasi experimental design, lack of extended follow-up, and lack of validation for survey findings were cited by the authors as possible limitations with this intervention. However, preliminary support was found for the use of the stage of change model in designing exercise interventions.

Cardinal (1995) developed two sets of stage-matched written materials about physical activity; one promoting lifestyle exercise and the other promoting structured exercise. The lifestyle exercise packet encouraged small increases in physical activity and included cognitive and behavioral activities that were stage-specific. The materials were developed from the processes of change identified by Marcus, Banspach et al. (1992). Individuals in precontemplation received a decision balance activity; contemplation received a behavioral assessment activity; preparation received a goal-setting activity;

and those in action and maintenance received prevention activities. The structured exercise packet was identical to the lifestyle packet in terms of format, but encouraged participants to follow a standard exercise prescription with specific recommendations for frequency, intensity, and duration. No significant difference was found between the two packets in effectiveness in increasing exercise behavior. The author encouraged researchers to use larger and more diverse samples to assess the generalizability of the findings and indicated that further study was planned using the materials.

Cardinal and Sachs (1995) studied one hundred and thirteen female university clerical employees in an intervention aimed at increasing participants' stage of change. Participants were stratified by baseline stage, then randomly received one of three mail-delivered, self-instructional, personalized written exercise packets. The lifestyle and structured exercise packets were those described in Cardinal (1995). In addition, a fitness feedback packet (i.e., control packet) was added which informed participants on their health status, predicted body fat percentage, and predicted $VO_2$ peak. Stage of change was assessed at baseline, then measures were repeated at one month and seven months post-intervention. A significant effect for stage of change across the three time periods was found. Those receiving the lifestyle exercise packet were most likely to advance stage of change at both one and seven months post-intervention. Independent of group, participants in the earlier stages at baseline (90% of precontemplators and contemplators combined) responded favourably to the intervention as evidenced by their improved stage.

Calfas et al. (1997) studied mediators of change in physical activity following an intervention in two hundred and fifty-five primary care patients. Specifically, the authors were interested in whether the intervention changed hypothesized mediators (i.e., processes of change, self-efficacy, and social support for exercise) and whether changes in mediators were associated with behavior change. The intervention was a brief counselling session by physicians, plus a telephone follow-up two weeks later. Assessments of physical activity and mediators were collected at baseline and four to six weeks post-intervention.

In the *PACE* (Physician-Based Assessment and Counselling for Exercise) intervention three stages of change were used: precontemplation (not physically active and no intention to start in the next six months); contemplation (not physically active, but intend to begin soon); and active (physically active on a regular basis). Individuals in precontemplation received information on identifying barriers and considering becoming active. Individuals in the contemplation or action stages were provided with specific behavioral strategies (e.g., information on social support, goal-setting, and problem solving around barriers) to help them reach their physical activity goal.

The protocol designed for contemplation was tested by Calfas et al. (1997) in which patients were asked to identify the type of physical activity they would like to participate in; when, where, and for how long they would like to be active; and who would support their activity program. The physician then reviewed the protocol with the patient and highlighted the importance of setting realistic goals, identifying sources of support, and increasing self-efficacy for their activity goal. In addition, examples of moderate and vigorous activities were provided to patients, as well as suggestions for overcoming

obstacles. Results indicated that patients who were counselled improved significantly more than patients in the control group on behavioral and cognitive processes of change. Other changes in mediators were non-significant. Behavioral processes of change and self-efficacy for time were associated with changes in physical activity regardless of condition and other variables. The construct validity of the intervention was partially supported.

Marcus and colleagues (1998) conducted the first prospective, randomized, controlled trial examining the efficacy of a stage-matched self-help intervention for exercise adoption compared with a standard self-help exercise promotion intervention. Worksite employees (n = 1559) received interventions at baseline and one month, with assessments of stage of change and exercise behavior collected at baseline and three months post-intervention. Participants in the *Jump Start to Health* campaign were given either printed self-help exercise promotion materials matched to the individual's stage of change (i.e., motivationally tailored) or standard materials.

The motivationally tailored intervention consisted of manuals that were developed based on the Marcus, Banspach et al. (1992) exercise intervention study. The precontemplation manual emphasized increasing awareness of the benefits of activity and prompted participants to examine barriers that prevent them from being active. The contemplation manual focused on the costs and benefits associated with becoming more active, reinforcement management, goal-setting, and social support. The preparation manual reviewed the benefits of physical activity and goal-setting, provided tips on safe and enjoyable activities, and addressed obstacles to activity. The action manual provided information on the benefits of activity, staying motivated, reinforcement management,

increasing self-efficacy, and overcoming obstacles. Lastly, the maintenance manual emphasized the benefits of physical activity, ways to avoid injury, goal-setting, varying activities, reinforcement management, and relapse prevention. The standard intervention consisted of five manuals developed by the American Heart Association, which were chosen to represent the typical action-oriented information available to the community. They included information regarding walking, swimming, cycling, dancing, and running for a healthy heart.

Results revealed that participants receiving the motivationally tailored intervention were significantly more likely to show increases (37% vs. 27%) and less likely to show either no change (52% vs. 58%) or regression (11% vs. 15%) in stage of change compared to participants receiving the standard intervention. Changes in stage were significantly associated with change in self-reported time spent in exercise. Further, the authors concluded that motivationally tailored interventions may be most effective for individuals in the earlier stages of change.

Bull, Kreuter, and Scharff (1999) conducted a randomized controlled trial among two hundred and seventy-two adult primary care patients to compare the effectiveness of tailored, personalized and general health messages, and usual medical care in promoting leisure time physical activity (LTAs) and physical activities of daily living (PADLs). All three intervention packages consisted of two pages of computer-generated printed materials. Tailored materials were based on patients' responses to questions assessing their stage of change, exercise goal, motives for and perceived barriers to obtaining the goal, and preferred type of physical activity. Standard materials consisted of an American Heart Association brochure on exercise which addressed health and psychological

benefits of exercise, choosing a type of physical activity, benefits and risks of exercise, and provided a checklist for getting started and a thirteen-week walking program to follow. The primary outcome of interest was change in level of physical activity.

Patients who received tailored materials were more likely to increase PADLs than were patients in the personalized, general, and control groups, and less likely to be doing fewer PADLs at follow-up. There were no significant differences for LTAs. The authors proposed that the value of tailoring depends on the ability to address important determinants of behavior change in ways that are most pertinent to individuals.

Although researchers have developed varying stage-matched written materials for exercise interventions based on the relationship between the stages and processes of change; a general trend has emerged. Stage-specific materials for precontemplation generally focus on consciousness raising, where individuals are prompted to consider their current physical activity habits. The main focus is to change the balance between the perceived number of pros (i.e., benefits) and cons (i.e., costs) associated with increasing physical activity. In the contemplation stage, the pros of engaging in physical activity are presented, along with information about learning to reward oneself, and the importance of goal-setting and social support. In the preparation stage, strategies to help reach a desired activity goal are usually presented (e.g., information on goal setting, reinforcement management, social support, and overcoming obstacles to physical activity). Essentially, these materials are designed to help individuals plan to become more regularly active by focusing on strategies/ techniques to overcome barriers and increasing self-efficacy. Materials developed for the action and maintenance stages tend to focus on overt activities that individuals can employ to facilitate relapse prevention and

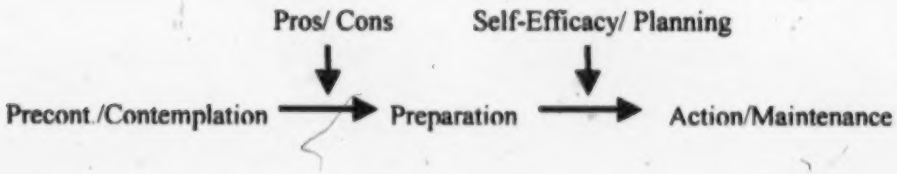
avoid injury, as individuals in these stages are already participating in regular exercise and the goal is to help them continue an active lifestyle (see Figure 1-1).

Although the action-oriented programs that are typically offered to the public may be effective with individuals in the later stages of change; these same programs may be ineffective and even detrimental to individuals in the earlier (e.g., precontemplation and contemplation) stages of change (Prochaska et al., 1992). As a result, effective interventions need to be developed for inactive, irregularly active, and regularly active individuals alike. Upon identifying an individual's stage of change, interventions emphasizing the most appropriate (i.e., stage matched) processes of change can be implemented in an effort to facilitate progression through the stages toward maintenance (Cardinal, Engels, & Zhu, 1998).

An examination of the existing literature on stage-matched exercise interventions presents a number of limitations that need to be addressed. First and foremost, relatively few studies have been conducted in this area. Additional studies will extend current knowledge about stage theories, and have implications for the design of effective exercise interventions. Second, three of the six studies lacked a control group. As a result, any inferences regarding the effect of the variable manipulated (i.e., independent variable)

Figure 1-1

Schematic Representation of a Stage-Matched Intervention



cannot be made. Third, the only outcome of interest was stage progression and occasionally exercise behavior, with the exception of the Calfas et al. (1997) study which included hypothesised mediators of change in physical activity (i.e., processes of change, self-efficacy). Stage progression may not be the only way to examine the effectiveness of stage-matching. Exploring the effects on hypothesised mediators may provide insight into which constructs the intervention influenced, even if a stage progression was not evidenced, and therefore are important for the development of future interventions. Lastly, the efficacy of stage-matched exercise interventions to date, has been tested by comparing stage-matched conditions with standardized treatment. Weinstein and colleagues (Weinstein et al., 1998a; Weinstein, Rothman, & Sutton, 1998b) however, suggest that stage-matching may be better evaluated by comparing matched with mismatched interventions (see Figure 1-2). If the matched treatment (i.e., one that is tailored to the individual's stage) is more effective than the mismatched treatment (i.e., matched to a different stage) in facilitating movement through the stages, then a stage process would be indicated.

Weinstein et al. (1998a) suggest that a 2 (stage) x 2 (intervention) design is "the simplest experimental test of the fundamental idea that different issues are important at different stages" (p. 446). In a study of home radon testing, Weinstein et al. (1998a) focused on two stage transitions, from undecided to decided-to-act and from decided-to-act to acting. A high likelihood intervention focused on increasing the perceived likelihood of having a home radon problem, and therefore was designed to influence those who were undecided about testing. The low effort intervention focused on decreasing the perceived and actual effort required to test and therefore, was

Figure 1-2

Stage-Matched Versus Mismatched Design

| Stage | Intervention: Pros | Intervention: Self-Efficacy/Planning |
|---|---|---|
| Precont./Cont. | Matched | Mismatched |
| Preparation | Mismatched | Matched |

stage-matched to those who had already decided-to-test. Study participants were assigned at random to one of the four experimental conditions. The basic hypothesis was that interventions matched to stage would be more effective than interventions that were mismatched, as evidenced by an interaction between stage and intervention.

The analysis showed a significant stage x high likelihood treatment interaction, indicating that the high likelihood treatment was much more effective for undecided participants than for decided-to-act participants. The stage x low effort treatment interaction indicated that the low effort intervention had a larger effect on individuals already planning to test than on individuals who were undecided. Thus, providing support for a stage process.

Recently, Quinlan & McCaul (2000) compared a stage-matched intervention for smoking cessation with a stage-mismatched intervention for ninety-two college-aged daily smokers in the precontemplation stage. The stage-matched intervention asked

smokers to consider quitting smoking; the mismatched intervention provided action-oriented activities typically used for individuals who are ready to quit smoking. Results indicated that a larger number of the participants who received a stage-mismatched intervention advanced in stage than in the stage-matched or control conditions, but this difference was not significant. Individuals in the stage-mismatched group also reported a stronger intention to quit than participants in the control condition. Additionally, the stage-mismatched group reported a stronger mean intention to quit than the matched condition; though, the difference was not significant. Thus, results failed to support the value of matching interventions to stage of change for smokers. This highlights the need for further examination into the efficacy of stage-matching, which can best be evaluated by comparing stage-matched versus stage-mismatched interventions (Weinstein et al., 1998a, 1998b).

Purpose and Hypotheses

The purpose of the present study was to evaluate whether individuals who received an informational intervention tailored to their stage of readiness to change for exercise adoption were more likely to progress in stage compared to those receiving an intervention that was not tailored (i.e., mismatched) to their stage.

It was hypothesized that:

1. Precontemplators/ Contemplators who received an intervention based on the pros of exercise (i.e., stage-matched) would increase in decisional balance (i.e., pros versus cons) and progress to preparation (i.e., intention for exercise in the next month), but would not change in self-efficacy;

2. Precontemplators/ Contemplators who received a self-efficacy and planning intervention (i.e., mismatched) would not change in decisional balance and would not progress to preparation, although they may change in self-efficacy;
3. Preparers who received a self-efficacy and planning intervention (i.e., stage-matched) would increase in self-efficacy and progress to the action stage (i.e., currently engaging in regular exercise), but decisional balance would not be affected;
4. Preparers who received an intervention based on the pros of exercise (i.e., mismatched) would not change in self-efficacy and would not progress to the action stage, although they may change in decisional balance.

# Chapter 2

## Methods

### Participants

Participants were two hundred and ninety-three undergraduate students in enrolled in courses in a psychology department at a local university who received credit for their participation. Participants had to indicate that they were in the precontemplation, contemplation, or preparation stage for vigorous exercise at baseline in order to be eligible for the study. Of the three hundred and eighteen participants initially recruited, five dropped out between the pre-test and post-test (two weeks), three failed to complete the questionnaire, and seventeen did not meet the eligibility criteria (i.e., participants were in the action stage at pretest).

To detect possible false reports of stage at pre-test, participants were asked to indicate the average frequency and duration over the past two weeks that they engaged in strenuous exercise (see Appendix J). Those who indicated a frequency of three or more times per week for thirty minutes or longer each session were considered in the action stage and ineligible for the study (n = 17). The final sample consisted of two hundred and ten females and eighty-three males. The mean age of participants was 19.4 (SD = 2.33) and the mean year in university was 1.6 (SD = .89).

### Design

The experimental design was a between-subjects factorial design with two treatments (i.e., pros versus self-efficacy and planning) by two stages (i.e., precontemplation/ contemplation versus preparation). Thus, four experimental conditions were created; two matched to stage and two mismatched. In addition, a control group was

added so that inferences could be made regarding the effect of the independent variable (i.e., intervention) on the dependent variables (i.e., decisional balance, processes of change, self-efficacy, exercise behavior, and intentions for vigorous exercise).

Procedures

Sign-up sheets for the study were posted in the department of psychology and students could sign-up for sessions that were offered at a variety of different times. Screening of participants occurred by placing a restriction on the sign-up booklet indicating that only students who did not currently engage in vigorous exercise for at least thirty minutes, three times per week were eligible. Vigorous exercise was defined as "any planned, organized, and repetitive (continuous) physical exertion aimed at improving or maintaining aerobic or muscular physical fitness and health, and intense enough to work up a sweat and/or cause heavy breathing." Each session required approximately the same amount of contact time with the experimenter.

Participants could sign-up for any of the ten sessions offered. As a result, each session comprised of participants in the precontemplation, contemplation, and preparation stages. Prior to beginning the first session, participants completed a stage of change measure to confirm their current stage for vigorous exercise behavior. Participants were then asked to complete a brief questionnaire, which assessed baseline measures for the dependent variables. Upon completion of the pre-test measures, participants in were instructed to read the informational package provided to them (except for the control group who did not receive an intervention), and then answer a few questions regarding the effectiveness of the package. All participants in a given session received the same

intervention. The pros intervention was presented in four of the ten sessions provided, the self-efficacy/planning intervention was also presented in four of the sessions, and two sessions were designated as control. The interventions were presented in random order. All participants were requested to return two weeks later (i.e., same day of the week and same time of day as the first session) in order to determine post-test measures, at which time they were debriefed about the purpose of the study.

Materials

The experiment was presented as an opportunity to provide feedback to the University of Alberta's Department of Physical Education and Recreation on an information package that was being developed to promote vigorous exercise in students. Two manuals (i.e., a pros manual, and a self-efficacy and planning manual) were utilized in this intervention.

The precontemplation/contemplation (i.e., pros) manual titled "why should I exercise" was designed to prompt individuals to consider their current exercise habits, and the positive consequences associated with increasing their level of physical exercise. Participants were presented with physiological and psychological benefits obtainable through participation in regular strenuous exercise (see Appendix D). The preparation (i.e., self-efficacy and planning) manual titled "planning to exercise" was intended to help individuals make a specific plan to incorporate regular vigorous exercise into their lifestyle. Roadblocks to participation in physical exercise were discussed, and possible solutions were provided. The concept of goal setting was introduced, along with steps for productive goal setting. Participants then answered questions important for consideration when choosing types of vigorous exercise to participate in. Additionally, an exercise plan

specifying the frequency, intensity, type, and time (i.e., amount) of exercise was determined, and a behavioral contract was presented (see Appendix E).

Instruments

Stage of change for exercise was measured using a questionnaire adapted from Marcus, Selby, Niaura, & Rossi (1992) which was adapted from the original stages of change measure developed for smoking cessation by Prochaska and DiClemente (1983). Participants were instructed to select the one statement that best describes their current exercise pattern. The statements provided were "I currently do not engage in regular vigorous exercise and I am not seriously considering starting in the next six months" (precontemplation), "I currently do not engage in regular vigorous exercise but I am seriously considering starting in the next six months" (contemplation), "I currently do not engage in regular vigorous exercise but I intend to start in the next month" (preparation), "I currently engage in regular vigorous exercise but I have only begun to do so within the last six months" (action) (see Appendix F). The first three statements were provided on the baseline questionnaire, with the addition of the fourth at post-test.

A two-week test-retest reliability of .79 for this measure (n = 148) has been reported by Courneya (1995), and Marcus, Selby, et al. (1992) reported a Kappa index of reliability over a two-week period of .78 (n = 20). Marcus and Simkin (1993) have demonstrated the concurrent validity for this measure using the Seven Day Physical Activity Recall questionnaire.

Decisional balance is a measure representing the relative strength of the pros (i.e., benefits) versus the cons (i.e., costs) of a behavior. Fifteen pro items (e.g., "I would feel more confident if I exercised regularly") and nine con items (e.g., "regular exercise

would take too much of my time") were measured using a questionnaire adapted from Marcus, Rakowski, et al. (1992). The items were adapted in order to line-up with intervention components. For example, the pros intervention highlighted the association of exercise with reduced risk for cancer; therefore, the questionnaire asked participants about their belief that physical exercise would decrease their chance of developing many types of cancer. Each item was rated on a Likert scale from 1 ("strongly disagree") through 5 ("strongly agree") (see Appendix G). The alpha levels for the pros scale were .86 at pre-test and .90 at post-test; the cons scale were .72 and .79 respectively.

The exercise Processes of Change Questionnaire (PCQ) developed by Marcus, Rossi, et al. (1992) consists of thirty-nine items which assess the ten processes of change. Individuals were asked to recall the past two weeks and rate the frequency of occurrence of each of the thirty-nine items on a five-point Likert scale from 1("never") through 5 ("repeatedly")(see Appendix H). Alpha values for the experiential processes of change were .77 and .80; behavioral processes of change were .77 and .82.

Self-efficacy refers to ones' beliefs about their ability to perform specific behaviors in specific situations (Bandura, 1977). Self-efficacy has been supported in the literature as an important determinant of exercise behavior change (see Appendix A). A ten item self-efficacy for exercise measure was administered (adapted from Marcus, Selby, et al., 1992). Participants indicated how confident they were that they could exercise in a variety of different situations (e.g., "when you are tired"). The items were adapted to coincide with the items presented in the self-efficacy intervention. Each item was rated on a scale of 1 ("not at all confident") through 5 ("extremely confident") (see Appendix I). Alpha levels for the self-efficacy scale were .80 and .85.

Exercise behavior was assessed using the Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin, Jobin, & Boullon, 1986; Godin & Shephard, 1985). The GLTEQ contains three questions covering the average frequency of mild, moderate, and strenuous exercise done during free time over the past month. However, participants were instructed to indicate their exercise behavior over the previous two weeks since there was only a two-week delay between the pre-test and post-test (see Appendix J).

Behavioral intention is the degree to which a person has developed conscious plans to engage in or not engage in a particular behavior in the future (Warshaw & Davis, 1985). Exercise intention was assessed using continuous-open and -closed scales as recommended by Courneya (1994; Courneya & McAuley, 1993). The three items were "In the next two weeks, I plan to exercise:" [item was rated on a scale of 1 ("not at all") through 7 ("everyday")], "I intend to exercise at least 3 times per week for 30 minutes at vigorous intensity over the next two weeks" [item was rated on a scale of 1 ("strongly disagree") through 7 ("strongly agree")], and "over the next two weeks, I intend to exercise vigorously at least _ times per week for 30 minutes or more each session" (participants were asked to indicate a number between 0 and 7)(see Appendix K). The alpha value for the intention scale was .89 at both time periods.

The effectiveness of the intervention was examined by having participants respond to questions about the informational package that they received. The items were: "did you learn any <u>additional</u> benefits of exercise that you did not previously know [rated on a scale of 1 ("no additional benefits") through 7 ("many additional benefits")]; did you learn any <u>additional</u> strategies/ techniques that would help you make vigorous exercise a more regular part of your lifestyle [rated on a scale of 1 ("no additional strategies")

through 7 ("many additional strategies")]; did the manual change your beliefs about the importance of regular vigorous exercise [rated on a scale of 1 ("not at all") through 7 ("increased significantly")]; do you feel confident that you have the tools necessary to make your own exercise plan [rated on a scale of 1 ("not very confident") through 7 ("extremely confident")]; and did you find the information presented useful" [rated on a scale of 1 ("not at all useful") through 7 ("extremely useful")]. Lastly, participants were asked "to comment on the strengths and weakness of the information package that was provided" (see Appendix L). The alpha level for this scale was .71.

Analyses

In order to analyze stage progression, the present study used a 2 (Time: pre-test vs. post-test) x 3 (Condition: matched vs. mismatched vs. control) repeated-measures analysis of variance (ANOVA). The stages of change were coded as 0 for precontemplation, 1 for contemplation, and 2 for preparation, with the addition of the action stage (coded as 3) at post-test.

The primary hypotheses for the mediating mechanisms of pros, cons, self-efficacy, processes of change, and intention were also examined using a 2 (Time: pre-test vs. post-test) x 3 (Condition: matched vs. mismatched vs. control) repeated-measures multivariate analysis of variance (MANOVA). Time was the within-subjects factor, Condition was the between-subjects factor, and the Time x Condition interaction was the primary effect of interest. Separate MANOVAs were conducted for the group of precontemplators/contemplators at baseline and the group of preparers at baseline, based on the premise that the mediating mechanisms expected to change are different

depending upon stage. Significant findings from the MANOVAs were followed-up with univariate F tests.

In order to analyze vigorous exercise behavior, a 2 (Time: pre-test vs. post-test) x 3 (Condition: matched vs. mismatched vs. control) repeated-measures analysis of variance (ANOVA) was used. Vigorous exercise was determined by multiplying the strenuous frequency (i.e., times per week) by the duration (i.e., number of minutes) indicated on the Godin Questionnaire.

Participants were asked to evaluate the intervention on whether they learnt any additional benefits of exercise that they did not previously know, and whether they learnt any additional strategies/techniques that would help them make vigorous exercise a more regular part of their lifestyle. An analysis of variance (ANOVA) was used to analyze the effectiveness of the intervention.

# Chapter 3

## Results

### Sample Distribution

Participants were randomly assigned to the stage-matched group (n = 119), the mismatched group (n = 125), or the control group (n = 49). Sixty-one participants in the precontemplation/contemplation stage received a matched intervention (i.e., the pros intervention); fifty-five received a mismatched intervention (i.e., the self-efficacy/planning intervention); and twenty-nine participants in the control group received no intervention. Fifty-eight participants in preparation received a matched intervention (i.e., the self-efficacy/planning intervention); seventy received a mismatched intervention (i.e., the pros intervention); and twenty participants received no intervention.

### Transtheoretical Model Variable Relationships

Descriptive statistics and bivariate correlations among each of the main constructs of interest are presented in Table 3-1 at pre-test and Table 3-2 at post-test. All constructs are significantly ($p < 0.01$) correlated to the stages (with the exception of dramatic relief, environmental reevaluation and social liberation at pre-test only), with intention having the largest correlation and the cons having the only negative relationship with the stages of change.

### Hypothesis Testing for Stage Progression

Descriptive statistics indicated that 34.5 % of participants in precontemplation/ contemplation who received the stage-matched intervention advanced stage, while 65.6 % showed no change in stage. In the mismatched condition, 36.4% of participants

Table 3-1

Descriptive Statistics and Correlations For Stages of Change, Pros, Cons, Self-Efficacy, Intention, Experiential Processes of Change, and Behavioral Processes of Change at Pre-Test

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Stage | .30** | -.25** | .23** | .56** | .33** | .10 | .11 | .30** | .11 | .12** | .32** | .30** | .25** | .25** | | |
| 2. Pros | | -.23** | .25** | .44** | .39** | .37** | .47** | .66** | .23** | .16** | .41** | .40** | .34** | .22** | 3.94 | .49 |
| 3. Cons | | | -.46** | -.37** | -.16** | -.06** | -.08** | -.10** | -.12** | -.12** | -.33** | -.41** | -.21** | -.24** | 2.36 | .54 |
| 4. Self-efficacy | | | | .42** | .26** | .11 | .14* | .24** | .15** | .22** | .36** | .48** | .23** | .19** | 2.51 | .59 |
| 5. Intention | | | | | .38** | .22** | .29** | .44** | .17** | .26** | .44** | .42** | .36** | .31** | 3.21 | 1.44 |
| 6. Consciousness raising | | | | | | .39** | .46** | .45** | .41** | .38** | .47** | .40** | .40** | .41** | 2.93 | .84 |
| 7. Dramatic relief | | | | | | | .41** | .39** | .26** | .22** | .30** | .26** | .35** | .32** | 2.77 | .94 |
| 8. Environmental reevaluation | | | | | | | | .53** | .44** | .31** | .43** | .25** | .35** | .34** | 2.77 | .90 |
| 9. Self-reevaluation | | | | | | | | | .33** | .22** | .51** | .37** | .40** | .21** | 3.60 | .93 |
| 10. Social Liberation | | | | | | | | | | .33** | .34** | .25** | .31** | .47** | 2.68 | .82 |
| 11. Stimulus control | | | | | | | | | | | .30** | .37** | .33** | .36** | 1.84 | .68 |
| 12. Self-liberation | | | | | | | | | | | | .52** | .60** | .41** | 3.29 | .80 |
| 13. Counter conditioning | | | | | | | | | | | | | .46** | .33** | 3.04 | .84 |
| 14. Reinforcement management | | | | | | | | | | | | | | .43** | 3.06 | .80 |
| 15. Helping Relationships | | | | | | | | | | | | | | | 2.30 | .93 |

Note. ** $p < .01$ (2-tailed); *$p < .05$ (2-tailed)

Table 3-2

Descriptive Statistics and Correlations For Stages of Change, Pros, Cons, Self-Efficacy, Intention, Experiential Processes of Change, and Behavioral Processes of Change at Post-Test

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | M | SD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Stage | .32** | -.33** | .27** | .49** | .33** | .13** | .17** | .36** | .18** | .17** | .39** | .32** | .31** | .19** | | |
| 2. Pros | | -.24** | .34** | .43** | .44** | .36** | .49** | .70** | .24** | .20** | .51** | .43** | .46** | .32** | 3.97 | .51 |
| 3. Cons | | | -.49** | -.34** | -.27** | -.08 | -.13** | -.26** | -.14** | -.13** | -.44** | -.40** | -.32** | -.24** | 2.40 | .56 |
| 4. Self-efficacy | | | | .48** | .31** | .20** | .26* | .35** | .16** | .33** | .48** | .59** | .36** | .32** | 2.63 | .62 |
| 5. Intention | | | | | .41** | .29** | .29** | .48** | .26** | .35** | .49** | .55** | .44** | .37** | 3.49 | 1.42 |
| 6. Consciousness raising | | | | | | .54** | .44** | .52** | .42** | .44** | .47** | .46** | .45** | .38** | 2.97 | .83 |
| 7. Dramatic relief | | | | | | | .45** | .40** | .32** | .37** | .41** | .37** | .34** | .44** | 2.85 | .95 |
| 8. Environmental reevaluation | | | | | | | | .56** | .48** | .39** | .44** | .33** | .38** | .49** | 3.02 | .87 |
| 9. Self-reevaluation | | | | | | | | | .38** | .31** | .64** | .49** | .61** | .41** | 3.59 | .89 |
| 10. Social Liberation | | | | | | | | | | .33** | .38** | .30** | .32** | .46** | 2.91 | .83 |
| 11. Stimulus control | | | | | | | | | | | .37** | .47** | .45** | .48** | 2.13 | .82 |
| 12. Self-liberation | | | | | | | | | | | | .51** | .65** | .44** | 3.48 | .77 |
| 13. Counter conditioning | | | | | | | | | | | | | .59** | .40** | 3.23 | .84 |
| 14. Reinforcement management | | | | | | | | | | | | | | .46** | 3.31 | .77 |
| 15. Helping Relationships | | | | | | | | | | | | | | | 2.60 | .95 |

Note. ** $p < .01$ (2-tailed); *$p < .05$ (2-tailed)

Table 3-3

Stage Changes for Participants in the Precontemplation/Contemplation Stage at Baseline

| | | Stage at post-test | | |
|---|---|---|---|---|
| Condition | | Precont./ Cont. | Preparation | Action |
| Matched | (n = 61) | 65.6 % (n = 40) | 23.0 % (n = 14) | 11.5 % (n = 7) |
| Mismatched | (n = 55) | 63.6 % (n = 35) | 29.1 % (n = 16) | 7.3 % (n = 4) |
| Control | (n = 29) | 51.7 % (n = 15) | 37.9 % (n = 11) | 10.3 % (n = 3) |

advanced stage and 63.6% remained stable. In the control condition, 48.2 % of participants advanced stage and 51.7 % demonstrated no stage change (see Table 3-3). Stage progression was analyzed using a 2 (Time: pre-test vs. post-test) x 3 (Condition: matched vs. mismatched vs. control) repeated-measures analysis of variance (ANOVA). The results of the ANOVA for the precontemplation/ contemplation stage indicated a main effect for Time [Wilks' $\lambda$ = .63; $F(1, 142) = 82.33$; $p < .001$], but no Time x Condition interaction [Wilks' $\lambda$ = .99; $F(2, 142) = .97$; $p > .05$].

Of the fifty-eight participants in preparation who received the stage-matched intervention, 36.2 % progressed to action, 50.0 % showed no change, and 13.8 % regressed in stage to precontemplation or contemplation. In the mismatched condition, 31.4 % advanced to action, 57.1 % remained stable, and 11.4 % regressed in stage. Finally, 50.0 % of participants in the control group advanced to the action stage, 45.0 % showed no stage change, and 5.0 % regressed to an earlier stage (see Table 3-4). Results of the ANOVA for stage progression indicated a main effect for Time [Wilks' $\lambda$ = .89; $F(1, 145) = 17.20$; $p < .001$], but no Time x Condition interaction [Wilks' $\lambda$ = .98; $F(2, 145) = 1.23$; $p > .05$] for the preparation stage.

Table 3-4

Stage Changes for Participants in the Preparation Stage at Baseline

| | | Stage at post-test | | |
|---|---|---|---|---|
| Condition | | Precont./ Cont. | Preparation | Action |
| Matched | (n = 58) | 13.8 % (n = 8) | 50.0 % (n = 29) | 36.2 % (n = 21) |
| Mismatched | (n = 70) | 11.4 % (n = 8) | 57.1 % (n = 40) | 31.4 % (n = 22) |
| Control | (n = 20) | 5.0 % (n = 1) | 45.0 % (n = 9) | 50.0 % (n = 10) |

Hypothesis Testing for the Mediating Mechanisms

Precontemplation/Contemplation Stage. The means and standard deviations for the TTM constructs for the precontemplation/contemplation stage by condition at pre-test and post-test are presented in Table 3-5 and Table 3-6. The results of the MANOVA for the precontemplation/contemplation stage indicated a main effect for Time [Wilks' $\lambda$ = .76; $F(6, 137) = 7.27$; $p < .01$], no main effect for Condition [Wilks' $\lambda$ = .90; $F(12, 274)$ = 1.18; $p > .05$], and no Time x Condition interaction [Wilks' $\lambda$ = .93; $F(12, 274)$ = .91; $p > .05$]. Follow-up univariate F tests for the main effect for Time revealed significant effects on cons [$F(1, 142) = 5.74$; $p < .05$], self-efficacy [$F(1, 142) = 4.07$; $p < .05$], intention [$F(1, 142) = 16.18$; $p < .001$], and behavioral processes of change [$F(1, 142)$ = 21.94; $p < .001$]. For descriptive purposes, results for all follow-up univariate F tests are presented in Table 3-9 and Table 3-10.

Preparation Stage. The means and standard deviations for the TTM constructs for the preparation stage by condition at pre-test and post-test are presented in Table 3-7 and Table 3-8. The results of the MANOVA for the preparation stage indicated a main effect

for Time [Wilks' $\lambda = .76$; $F(6, 140) = 7.50$; $p < .01$], no main effect for Condition [Wilks' $\lambda = .93$; $F(12, 280) = .93$; $p > .05$], and no Time x Condition interaction [Wilks' $\lambda = .90$; $F(12, 280) = 1.26$; $p > .05$]. Follow-up univariate F tests for the main effect for Time revealed significant effects on self-efficacy [$F(1, 145) = 12.51$; $p < .001$], intention [$F(1, 145) = 6.03$; $p < .05$], experiential processes of change [$F(1, 14) = 14.73$; $p < .001$], and behavioral processes of change [$F(1, 145) = 41.48$; $p < .001$]. Once again, for descriptive purposes, results for all follow-up univariate F tests are presented in Table 3-11 and Table 3-12.

Vigorous Exercise Behavior

Precontemplation/Contemplation Stage. The means and standard deviations for vigorous exercise for the precontemplation/contemplation stage by condition at pre-test and post-test are presented in Table 3-13. Vigorous exercise behavior was analyzed using a 2 (Time: pre-test vs. post-test) x 3 (Condition: matched vs. mismatched vs. control) repeated-measures analysis of variance (ANOVA). The results of the ANOVA for the precontemplation/contemplation stage indicated a main effect for Time [Wilks' $\lambda = .95$; $F(1, 142) = 7.60$; $p < .01$], but no Time x Condition interaction [Wilks' $\lambda = .99$; $F(2, 142) = .52$; $p > .05$].

Preparation Stage. The means and standard deviations for vigorous exercise for the preparation stage by condition at pre-test and post-test are presented in Table 3-13. The results of the repeated-measures ANOVA for vigorous exercise indicated a main effect for Time [Wilks' $\lambda = .86$; $F(1, 145) = 23.51$; $p < .001$], but no Time x Condition interaction [Wilks' $\lambda = .99$; $F(2, 145) = .33$; $p > .05$] for the preparation stage.

Table 3-5

Means and Standard Deviations for the TTM Constructs by Condition at Pre- and Post-test for Participants in the Precontemplation/Contemplation Stage at Baseline

| Construct | | Control | | Mismatched | | Matched | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Pros | M | 3.91 | 3.83 | 3.75 | 3.80 | 3.76 | 3.80 | 3.79 | 3.80 |
| | SD | .60 | .67 | .46 | .45 | .46 | .53 | .49 | .53 |
| Cons | M | 2.42 | 2.52 | 2.49 | 2.53 | 2.53 | 2.66 | 2.50 | 2.58 |
| | SD | .40 | .52 | .56 | .57 | .54 | .58 | .52 | .56 |
| Self-Efficacy | M | 2.31 | 2.31 | 2.46 | 2.57 | 2.34 | 2.44 | 2.37 | 2.46 |
| | SD | .43 | .63 | .58 | .69 | .63 | .59 | .57 | .64 |
| Intention | M | 2.45 | 2.72 | 2.40 | 2.79 | 2.37 | 2.83 | 2.39 | 2.79 |
| | SD | 1.43 | 1.39 | .98 | 1.29 | 1.28 | 1.42 | 1.19 | 1.35 |
| Experiential Processes | M | 2.84 | 2.83 | 2.89 | 2.97 | 2.66 | 2.78 | 2.79 | 2.86 |
| | SD | .70 | .66 | .67 | .65 | .65 | .68 | .67 | .67 |
| Behavioral Processes | M | 2.59 | 2.65 | 2.60 | 2.86 | 2.40 | 2.63 | 2.50 | 2.72 |
| | SD | .64 | .68 | .56 | .60 | .60 | .60 | .60 | .65 |

Table 3-6

Means and Standard Deviations for the Processes of Change by Condition at Pre- and Post-test for Participants in the Precontemplation/Contemplation Stage at Baseline

| Construct | | Control | | Mismatched | | Matched | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Consciousness Raising | M | 2.71 | 2.59 | 2.82 | 2.83 | 2.47 | 2.60 | 2.65 | 2.69 |
| | SD | .82 | .79 | .80 | .86 | .75 | .78 | .79 | .82 |
| Dramatic Relief | M | 2.79 | 2.72 | 2.71 | 2.80 | 2.61 | 2.65 | 2.68 | 2.72 |
| | SD | .97 | .95 | .98 | .94 | .93 | .82 | .95 | .89 |
| Environmental Reevaluation | M | 2.75 | 2.92 | 2.73 | 2.98 | 2.58 | 2.74 | 2.68 | 2.87 |
| | SD | 1.09 | .90 | .87 | .84 | .85 | .88 | .92 | .87 |
| Self-Reevaluation | M | 3.40 | 3.28 | 3.39 | 3.32 | 3.23 | 3.20 | 3.33 | 3.26 |
| | SD | 1.04 | .87 | .85 | .83 | 1.03 | .99 | .97 | .91 |
| Social Liberation | M | 2.54 | 2.66 | 2.82 | 2.90 | 2.40 | 2.69 | 2.60 | 2.76 |
| | SD | .78 | .92 | .85 | .83 | .78 | .84 | .82 | .85 |
| Counter Conditioning | M | 2.79 | 2.79 | 2.91 | 3.11 | 2.65 | 2.89 | 2.78 | 2.95 |
| | SD | .96 | .89 | .74 | .77 | .93 | .95 | .86 | .88 |
| Helping Relationships | M | 2.19 | 2.43 | 2.19 | 2.51 | 1.95 | 2.31 | 2.08 | 2.41 |
| | SD | .96 | 1.01 | .95 | .98 | .85 | .90 | .91 | .95 |
| Reinforcement Management | M | 2.99 | 3.02 | 2.89 | 3.15 | 2.82 | 3.02 | 2.86 | 3.07 |
| | SD | .83 | .75 | .76 | .72 | .88 | .79 | .83 | .76 |
| Self-Liberation | M | 3.19 | 3.16 | 3.14 | 3.34 | 2.90 | 3.05 | 3.04 | 3.18 |
| | SD | .73 | .86 | .76 | .67 | .80 | .70 | .78 | .73 |
| Stimulus Control | M | 1.77 | 1.84 | 1.85 | 2.17 | 1.70 | 1.90 | 1.77 | 1.99 |
| | SD | .70 | .79 | .64 | .73 | .66 | .81 | .66 | .78 |

Table 3-7

Means and Standard Deviations for the TTM Constructs by Condition at Pre- and Post-test for Participants in the Preparation Stage at Baseline

| Construct | | Control | | Mismatched | | Matched | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Pros | M | 4.15 | 4.15 | 3.97 | 4.09 | 4.17 | 4.17 | 4.08 | 4.13 |
| | SD | .46 | .45 | .40 | .40 | .42 | .48 | .43 | .44 |
| Cons | M | 2.11 | 2.17 | 2.25 | 2.27 | 2.21 | 2.17 | 2.23 | 2.22 |
| | SD | .51 | .42 | .44 | .46 | .59 | .55 | .51 | .49 |
| Self-Efficacy | M | 2.56 | 2.78 | 2.57 | 2.73 | 2.75 | 2.87 | 2.65 | 2.79 |
| | SD | .60 | .58 | .48 | .48 | .67 | .65 | .58 | .56 |
| Intention | M | 3.62 | 4.12 | 4.11 | 4.15 | 3.99 | 4.24 | 4.01 | 4.18 |
| | SD | 1.06 | 1.13 | 1.15 | 1.16 | 1.27 | 1.09 | 1.19 | 1.12 |
| Experiential Processes | M | 3.03 | 3.29 | 3.06 | 3.21 | 3.20 | 3.33 | 3.11 | 3.27 |
| | SD | .62 | .64 | .52 | .55 | .58 | .59 | .56 | .58 |
| Behavioral Processes | M | 2.84 | 3.21 | 2.90 | 3.14 | 2.94 | 3.21 | 2.91 | 3.17 |
| | SD | .51 | .63 | .55 | .50 | .48 | .57 | .51 | .54 |

Table 3-8

Means and Standard Deviations for the Processes of Change by Condition at Pre- and Post-test for Participants in the Preparation Stage at Baseline

| Construct | | Control | | Mismatched | | Matched | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Consciousness Raising | M | 3.13 | 3.15 | 3.13 | 3.17 | 3.35 | 3.36 | 3.21 | 3.24 |
| | SD | .83 | .76 | .72 | .69 | .86 | .82 | .79 | .75 |
| Dramatic Relief | M | 2.75 | 3.02 | 2.73 | 2.90 | 3.05 | 3.05 | 2.85 | 2.97 |
| | SD | .97 | 1.01 | .82 | .91 | 1.01 | 1.06 | .93 | .98 |
| Environmental Reevaluation | M | 2.74 | 3.26 | 2.89 | 3.17 | 2.84 | 3.11 | 2.87 | 3.16 |
| | SD | .85 | .78 | .81 | .86 | .93 | .87 | .87 | .85 |
| Self-Reevaluation | M | 3.74 | 3.89 | 3.72 | 3.76 | 4.09 | 4.10 | 3.87 | 3.91 |
| | SD | .72 | .75 | .81 | .77 | .76 | .72 | .79 | .76 |
| Social Liberation | M | 2.81 | 3.13 | 2.86 | 3.07 | 2.67 | 3.02 | 2.77 | 3.06 |
| | SD | 1.00 | 1.00 | .75 | .78 | .79 | .69 | .80 | .78 |
| Counter Conditioning | M | 3.21 | 3.56 | 3.18 | 3.34 | 3.45 | 3.64 | 3.28 | 3.49 |
| | SD | .55 | .66 | .78 | .68 | .73 | .77 | .74 | .72 |
| Helping Relationships | M | 2.30 | 2.73 | 2.70 | 2.80 | 2.45 | 2.77 | 2.52 | 2.78 |
| | SD | .91 | .92 | .91 | .86 | .83 | 1.00 | .89 | .92 |
| Reinforcement Management | M | 3.28 | 3.50 | 3.22 | 3.51 | 3.31 | 3.60 | 3.26 | 3.54 |
| | SD | .61 | .81 | .74 | .66 | .71 | .77 | .71 | .72 |
| Self-Liberation | M | 3.40 | 3.80 | 3.51 | 3.78 | 3.61 | 3.78 | 3.54 | 3.78 |
| | SD | .66 | .65 | .74 | .66 | .76 | .76 | .75 | .69 |
| Stimulus Control | M | 2.00 | 2.45 | 1.92 | 2.25 | 1.88 | 2.24 | 1.92 | 2.27 |
| | SD | .76 | 1.04 | .66 | .77 | .73 | .82 | .70 | .83 |

Table 3-9

Degrees of Freedom, F Statistic, and p Levels for the TTM Constructs for Participants in the Precontemplation/Contemplation Stage at Baseline

| Construct | | df | F | Sig. |
|---|---|---|---|---|
| Pros | Time | (1, 142) | .001 | .97 |
| | Condition | (2, 142) | .42 | .66 |
| | Time x Condition | (2, 142) | 1.81 | .17 |
| Cons | Time | (1, 142) | 5.74 | .02* |
| | Condition | (2, 142) | .74 | .48 |
| | Time x Condition | (2, 142) | .62 | .54 |
| Self-Efficacy | Time | (1, 142) | 4.07 | .05* |
| | Condition | (2, 142) | 1.30 | .28 |
| | Time x Condition | (2, 142) | .74 | .48 |
| Intention | Time | (1, 142) | 16.18 | .001* |
| | Condition | (2, 142) | .001 | .99 |
| | Time x Condition | (2, 142) | .31 | .73 |
| Experiential Processes of Change | Time | (1, 142) | 3.15 | .08 |
| | Condition | (2, 142) | 1.62 | .20 |
| | Time x Condition | (2, 142) | .96 | .39 |
| Behavioral Processes of Change | Time | (1, 142) | 21.94 | .001* |
| | Condition | (2, 142) | 1.88 | .16 |
| | Time x Condition | (2, 142) | 1.98 | .14 |

Note. * $p < .05$ (2-tailed)

Table 3-10

Degrees of Freedom, F Statistic, and p Levels for the Processes of Change for Participants in the Precontemplation/Contemplation Stage at Baseline

| Construct | | df | F | Sig. |
|---|---|---|---|---|
| Consciousness Raising | Time | (1, 142) | .02 | .89 |
| | Condition | (2, 142) | 2.39 | .10 |
| | Time x Condition | (2, 142) | 1.41 | .25 |
| Dramatic Relief | Time | (1, 142) | .09 | .77 |
| | Condition | (2, 142) | .39 | .68 |
| | Time x Condition | (2, 142) | .40 | .67 |
| Environmental Reevaluation | Time | (1, 142) | 10.49 | .001* |
| | Condition | (2, 142) | .91 | .41 |
| | Time x Condition | (2, 142) | .25 | .78 |
| Self-Reevaluation | Time | (1, 142) | 1.61 | .21 |
| | Condition | (2, 142) | .41 | .66 |
| | Time x Condition | (2, 142) | .26 | .77 |
| Social Liberation | Time | (1, 142) | 10.05 | .002* |
| | Condition | (2, 142) | 2.51 | .09 |
| | Time x Condition | (2, 142) | 2.09 | .13 |
| Counter Conditioning | Time | (1, 142) | 6.33 | .01* |
| | Condition | (2, 142) | 1.52 | .22 |
| | Time x Condition | (2, 142) | 1.33 | .27 |
| Helping Relationships | Time | (1, 142) | 24.57 | .001* |
| | Condition | (2, 142) | 1.04 | .36 |
| | Time x Condition | (2, 142) | .28 | .76 |
| Reinforcement Management | Time | (1, 142) | 6.39 | .01* |
| | Condition | (2, 142) | .34 | .71 |
| | Time x Condition | (2, 142) | 1.00 | .37 |
| Self-Liberation | Time | (1, 142) | 3.09 | .08 |
| | Condition | (2, 142) | 2.46 | .09 |
| | Time x Condition | (2, 142) | .99 | .38 |
| Stimulus Control | Time | (1, 142) | 11.43 | .001* |
| | Condition | (2, 142) | 1.77 | .17 |
| | Time x Condition | (2, 142) | 1.42 | .25 |

Note. * $p < .05$ (2-tailed)

Table 3-11

Degrees of Freedom, F Statistic, and p Levels for the TTM Constructs for Participants in the Preparation Stage at Baseline

| Construct | | df | F | Sig. |
|---|---|---|---|---|
| Pros | Time | (1, 145) | 1.27 | .26 |
| | Condition | (2, 145) | 2.26 | .11 |
| | Time x Condition | (2, 145) | 2.43 | .09 |
| Cons | Time | (1, 145) | .16 | .70 |
| | Condition | (2, 145) | .70 | .50 |
| | Time x Condition | (2, 145) | .88 | .42 |
| Self-Efficacy | Time | (1, 145) | 12.51 | .001* |
| | Condition | (2, 145) | 1.64 | .20 |
| | Time x Condition | (2, 145) | .39 | .68 |
| Intention | Time | (1, 145) | 6.03 | .02* |
| | Condition | (2, 145) | .57 | .57 |
| | Time x Condition | (2, 145) | 1.54 | .22 |
| Experiential Processes of Change | Time | (1, 145) | 14.73 | .001* |
| | Condition | (2, 145) | .96 | .38 |
| | Time x Condition | (2, 145) | .54 | .58 |
| Behavioral Processes of Change | Time | (1, 145) | 41.48 | .001* |
| | Condition | (2, 145) | .22 | .80 |
| | Time x Condition | (2, 145) | .68 | .51 |

Note. * $p < .05$ (2-tailed)

Table 3-12

Degrees of Freedom, F Statistic, and p Levels for the Processes of Change for Participants in the Preparation Stage at Baseline

| Construct | | df | F | Sig. |
|---|---|---|---|---|
| Consciousness Raising | Time | (1, 145) | .13 | .72 |
| | Condition | (2, 145) | 1.78 | .17 |
| | Time x Condition | (2, 145) | .04 | .96 |
| Dramatic Relief | Time | (1, 145) | 2.55 | .11 |
| | Condition | (2, 145) | 1.28 | .28 |
| | Time x Condition | (2, 145) | .78 | .46 |
| Environmental Reevaluation | Time | (1, 145) | 24.98 | .001* |
| | Condition | (2, 145) | .08 | .93 |
| | Time x Condition | (2, 145) | .98 | .38 |
| Self-Reevaluation | Time | (1, 145) | 1.51 | .29 |
| | Condition | (2, 145) | 4.23 | .02* |
| | Time x Condition | (2, 145) | .35 | .71 |
| Social Liberation | Time | (1, 145) | 16.60 | .001* |
| | Condition | (2, 145) | .53 | .59 |
| | Time x Condition | (2, 145) | .56 | .57 |
| Counter Conditioning | Time | (1, 145) | 12.29 | .001* |
| | Condition | (2, 145) | 3.30 | .04* |
| | Time x Condition | (2, 145) | .53 | .59 |
| Helping Relationships | Time | (1, 145) | 15.41 | .001* |
| | Condition | (2, 145) | .88 | .42 |
| | Time x Condition | (2, 145) | 2.04 | .13 |
| Reinforcement Management | Time | (1, 145) | 17.56 | .001* |
| | Condition | (2, 145) | .33 | .72 |
| | Time x Condition | (2, 145) | .08 | .93 |
| Self-Liberation | Time | (1, 145) | 18.04 | .001* |
| | Condition | (2, 145) | .22 | .81 |
| | Time x Condition | (2, 145) | .91 | .41 |
| Stimulus Control | Time | (1, 145) | 23.89 | .001* |
| | Condition | (2, 145) | .49 | .61 |
| | Time x Condition | (2, 145) | .17 | .84 |

Note. * $p < .05$ (2-tailed)

Table 3-13

Means and Standard Deviations for Vigorous Exercise by Condition at Pre- and Post-test for Participants in the Precontemplation/Contemplation and Preparataion Stage at Baseline

| Stage | | Control | | Mismatched | | Matched | | Overall | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Precontemplation/ Contemplation | M | 41.90 | 62.76 | 36.73 | 47.29 | 28.92 | 54.10 | 34.38 | 53.25 |
| | SD | 74.26 | 87.38 | 74.72 | 67.00 | 46.98 | 98.05 | 64.12 | 84.88 |
| Preparation | M | 33.50 | 72.50 | 56.36 | 101.24 | 48.02 | 80.69 | 50.00 | 89.30 |
| | SD | 31.67 | 51.59 | 80.15 | 110.36 | 52.21 | 73.70 | 65.27 | 91.12 |

Note. Vigorous exercise was determined by multiplying the strenuous frequency per week by the duration (in minutes).

Effectiveness of the Intervention

The means and standard deviations for the effectiveness of the intervention are presented in Table 3-14. The results of the ANOVA for additional benefits learnt indicated no main effect for Stage [$F(1, 243) = .05$; $p > .05$] or Condition [$F(1, 243) = .88$; $p > .05$], but there was a Stage x Condition interaction [$F(1, 243) = 70.80$; $p < .001$]. Similarly, no main effect for Stage [$F(1, 243) = .57$; $p > .05$] or Condition [$F(1, 243) = .11$; $p > .05$] was evidenced for additional strategies/techniques learnt, but a Stage x Condition interaction was indicated [$F(1, 243) = 4.95$; $p < .05$].

Table 3-14

Means and Standard Deviations for the Effectiveness of the Intervention by Condition for Participants in the Precontemplation/Contemplation and Preparation Stage at Baseline

| Effectiveness at Presenting: | | Precontemplation/Contemplation | | Preparation | |
|---|---|---|---|---|---|
| | | Matched | Mismatched | Matched | Mismatched |
| Additional Benefits | M | 4.87 | 3.46 | 3.33 | 5.09 |
| | SD | 1.38 | 1.70 | 1.65 | 1.11 |
| Additional Strategies/ Techniques | M | 3.61 | 4.09 | 4.17 | 3.81 |
| | SD | 1.36 | 1.62 | 1.66 | 1.28 |

# Chapter 4

## Discussion

The purpose of stage-matching is to provide individuals with interventions that are tailored to their readiness to change in an effort to facilitate stage progression (Cardinal et al., 1998). It is based on the premise that different types of interventions (i.e., processes of change) are important at different stages, and that interventions that emphasize stage-matched processes of change (i.e., processes that are thought to be needed to facilitate progression to the next stage) should produce better results than a mismatched intervention (i.e., which emphasize processes matched to a different stage). For example, the precontemplation/contemplation stage-matched intervention utilized in the present study emphasized experiential processes of change (e.g., consciousness raising), as recommended by the TTM, in which the benefits of engaging in regular exercise were presented. According to the principle of stage-matching, this intervention should be effective (i.e., help individuals advance stage) since it focuses on the processes most relevant for progression from this stage. Conversely, if individuals in precontemplation/ contemplation were presented with information based on the behavioral processes of change (e.g., self-liberation), as in the stage-mismatched condition, no advancement in stage should be evidenced. The information presented in the mismatched condition focuses on processes thought to be important for a different stage (i.e., preparation) and therefore, are not relevant for precontemplators/ contemplators.

The purpose of the present study was to examine whether individuals who received a stage-matched exercise intervention were more likely to progress in stage compared to those receiving a stage-mismatched intervention (i.e., matched to a different stage) or no intervention (i.e., control group). In addition, the present study examined vigorous exercise behavior, and the hypothesized mediators of change, as proposed by the TTM.

Stage Progression

Results of the repeated-measures ANOVA indicated a main effect for Time, but no Time x Condition interaction in either stage. Therefore, participants in both the precontemplation/ contemplation and preparation stages at baseline significantly progressed in stage, regardless of condition. It was hypothesized, however, that a stage-matched intervention would result in stage progression, while a stage-mismatched intervention would not. Consequently, the results did not support the hypotheses, as stage progression was evident in all three conditions.

Five of the six stage-matched exercise interventions conducted to date, with the exception of the Calfas et al. (1997) study, have used stage progression and occasionally exercise behavior as the only outcomes for determining the effectiveness of stage-matching (see Appendix C). Results from these studies have shown support for the efficacy of stage-matching, as participants who received matched interventions significantly progressed in stage and/or level of physical activity (see Calfas et al., 1997; Marcus, Banspach, et al., 1992; Marcus et al., 1998). However, past exercise research has not employed a mismatched design in the examination of the efficacy of stage-matching. Since stage progression was evident in all three conditions, the hypothesis that a matched

intervention would be more effective than a mismatched intervention in producing stage advancement was not supported.

Similar results have been indicated in the literature for smoking cessation. Dijkstra, De Vries, Roijackers, & van Breukelen (1998) found that a stage-matched and a stage-mismatched intervention produced similar results for intention to quit, stage advancement, and cessation rates for people low in regard to readiness to quit (i.e., precontemplators). They also found that more stage movement occurred in both the matched and mismatched conditions than in the control condition. Most recently, Quinlan & McCaul (2000) found that a larger number of the participants who received a stage-mismatched intervention advanced in stage than in the stage-matched or control conditions, but this difference was not significant. Individuals in the stage-mismatched group reported a stronger intention to quit than participants in the control condition. In addition, the stage-mismatched group reported a higher mean intention to quit than the matched condition; though, this difference was not significant.

Future exercise research should consider the value of experimental designs that compare stage-matched and mismatched intervention (as suggested by Weinstein et al., 1998a, 1998b). A mismatched design enables a comparison of the effects of stage-matched information with information that is not thought to be relevant in producing stage progression. Thus, it provides a better test of support for a stage framework.

Mediating Mechanisms

Calfas et al. (1997) suggest that if an intervention significantly increases physical activity, then it is appropriate to examine the mediating mechanisms of those changes; more specifically, whether the intervention produced changes in the mediators it was

intended to affect. Results from their study indicated that two of the three mediator variables (i.e., self-efficacy and behavioral processes of change) were associated with changes in physical activity.

Based on the TTM theory, it was hypothesised that participants in the precontemplation/ contemplation stage who received a matched intervention (i.e., focused on consciousness raising and self-reevaluation) would increase in experiential processes of change and thereby increase in pros and intention for exercise, and ultimately progress in stage. Univarite F tests revealed a main effect for Time on behavioral processes of change, self-efficacy, intention, and cons. Contrary to the prediction, significant findings were indicated for behavioral processes of change and not experiential processes of change. Since the behavioral processes of change, self-efficacy and intention for exercise increased, stage progression was evident. The significant finding of increased cons could be a result of answering questions about exercise, which may prompt individuals to consider their reasons for or against engaging in regular exercise.

In the mismatched condition, participants received an intervention based on the behavioral processes of change (i.e., self-liberation and reinforcement management). It was hypothesised that participants might ignore this "how-to" information because it is not relevant to them yet (Dijkstra et al., 1998). However, results indicated that the mismatched participants utilized these behavioral processes of change. Thus, the resulting stage progression is consistent with the TTM theory.

Since no intervention was being provided to control participants, they were not expected to change on any of the TTM constructs across time. It is unclear as to why the control participants in both stages demonstrated such large changes in stage and on

hypothesised mediators of change when no intervention was provided to them. Possible explanations could include: improvements due to a demand awareness effect where participants remember their answers from pre-test and report higher at post-test (two weeks later) because they believe that is what the experimenter was looking for, or simply answering questions about exercise may prompt individuals to consider their current exercise beliefs and/or behaviors, and make changes. In addition, consideration should also be given to the small sample size of the control group (n = 20 in precontemplation/contemplation, n = 29 in preparation). Due to the small sample size, the results may not be normal, and therefore should be interpreted cautiously.

In the preparation stage, participants who received a matched intervention based on self-efficacy and planning were hypothesised to increase on behavioral processes of change. Consequently, increases in self-efficacy, intention, and stage were expected to follow. Results of the univariate F tests indicated a main effect for Time on self-efficacy, intention, and both experiential and behavioral processes of change. Findings were consistent with the hypotheses. However, a significant effect was found for the experiential processes of change even though the stage-matched intervention did not present any information designed to influence these processes.

In the mismatched condition, participants were presented with an intervention designed for precontemplators/contemplators, which focused on experiential processes of change and increasing the pros for exercise. Since participants in this condition were not presented with any information to help enhance self-efficacy (i.e., behavioral processes) it was expected that self-efficacy would not be effected; therefore, no change in stage would result. Findings indicated that participants in the mismatched condition utilized not

only the experiential processes of change, but the behavioral processes as well. Given that the behavioral processes were significantly effected, it is reasonable that self-efficacy and intention increased significantly, which resulted in stage progression.

Future research should consider the value in examining hypothesized mediators of change for exercise, in addition to stage progression. This allows for a closer examination into whether stage progression was a direct result of the targeted (i.e., based on processes of change) information being effected.

In addition, other theoretical models might prove useful for understanding stage change. A number of researchers (Courneya, 1995; Lee, 1993; Murphy, 1993; Sonstroem, 1988) believe that the theory of planned behavior (TPB; Ajzen, 1991) may also be relevant for understanding "why" stage-change has occurred. The TPB constructs (i.e., perceived behavioral control, attitude, and subjective norm) have been shown to be significant predictors of exercise stage (see Courneya, Nigg, & Estabrooks, 1998). It has been suggested (Courneya et al., 1998) that combining the TPB constructs with the processes of change from the TTM might be useful in understanding "how" people change their exercise stage. The results from such experiments could provide insight into the types of strategies that motivate people to change their behavior.

Vigorous Exercise Behavior

Results of the repeated-measures ANOVA for vigorous exercise behavior indicated a main effect for Time, but no Time x Condition interaction in either stage. Therefore, participants in both the precontemplation/ contemplation and preparation stages at baseline significantly increased in vigorous exercise behavior, regardless of

condition. It is possible that simply answering questions about vigorous exercise may be enough to change participants' vigorous exercise behavior.

Support for the Transtheoretical Model of Change

The present study may have failed to support the hypotheses and the prediction that matching an intervention to stage of change is important because the content of the interventions may not have been stage-matched or mismatched accurately. Stage models are useful in creating interventions only if it is possible to identify and modify the specific strategies and beliefs that cause individuals to progress from one stage to the next; currently, these are not well defined (Weinstein et al., 1998b).

In the precontemplation/contemplation stage, the mismatched intervention focused on behavioral processes of change in an effort to increase self-efficacy. This information is not thought to be relevant to precontemplators/contemplators and thus, stage progression is not expected. However, participants in the contemplation stage are seriously considering changing their behavior, so they likely have already considered the consequences associated with their level of exercise. These participants may be ready to incorporate some of the strategies for increasing self-efficacy that were presented in the mismatched intervention (i.e., intervention designed for preparers). Since stage progression was evident for participants receiving this mismatched intervention, the intervention may not have been truly "mismatched". It is possible that since the two stages were directly next to each other in the sequence of stages, individuals may utilize both experiential and behavioral processes of change, but to different degrees and not completely independent of each other. Weinstein and colleagues (1998b) propose that "a

perfectly mismatched treatment may be as difficult to find as a perfectly matched treatment" (p. 296).

There is also the possibility that stage-matching was not supported in the present study because a stage process was not indicated. According to Weinstein and colleagues (Weinstein et al., 1998a, 1998b), a stage process is indicated if the matched treatment is more effective than the mismatched treatment in facilitating movement through the stages. In other words, support for a stage framework requires treatments to have different effects at different stages, which the results failed to show. However this is not likely the case, as changes in hypothesized mediators resulted in stage progression, which supports the TTM theory. The failure appears to be with the interventions not resulting in differential manipulation of the TTM constructs.

Intervention Concerns

Intensity. The experiment presented may not have been intense enough to produce the expected results. This was a relatively short intervention, in which participants were only presented with a few pages of written materials. On average, participants were able to read the information package in five to ten minutes. Although most stage-matched interventions in the exercise domain have used written materials as the primary means of delivering the intervention, Marcus, Banspach et al.'s (1992) *Imagine Action* campaign included a resource manual describing activity options in the community, and weekly "fun walks" and "activity nights". In another study by Marcus et al. (1998), researchers chose to send a personalized letter to participants describing the manual they received, which also emphasized motivationally relevant messages. A

"multistrategy intervention" that uses several modalities for intervention delivery (e.g., in person contact with educator, computer generated reminders) may be more effective (Rimer, 1994).

Content. Another possible explanation as to why the present study may have failed to support the predictions is a result of the content of the interventions. In the precontemplation/ contemplation stage-matched intervention, it was hypothesized that the experiential processes of change would increase significantly for participants in this condition. However, results indicated a main effect for Time on behavioral processes of change and not on experiential processes. Similarly, in the preparation stage it was hypothesized that only behavioral processes of change would be effected, yet both experiential and behavioral processes showed significant changes. This suggests that the interventions may not have been differentiated by the processes of change presented (i.e., experiential vs. behavioral).

Additionally, there may have been a deficiency in the comprehensiveness of the content presented in the interventions. The present study, and pros manual, focused mainly on two experiential process of change (i.e., consciousness raising and self-reevaulation) thought important for progression from the precontemplation/contemplation stage to the preparation stage. The self-efficacy/planning manual focused on two behavioral processes of change (i.e., self-liberation and reinforcement management) thought important for progression from the preparation stage to the action stage. Although the use of specific processes at different stages are suggested (see Prochaska et al., 1992), the literature seems to recommend that the experiential processes are used most often in the earlier stages, while behavioral processes of change help modify the

target behavior in later stages of change. Previous studies have not stated the specific processes presented in their interventions. Future research might want to examine the impact of presenting all five experiential processes or behavioral processes of change in a single intervention, in case some of the processes are more effective than others in facilitating stage progression.

One should also consider the possibility that the experiential and behavioral processes of change used by individuals may depend upon the behavior being examined. The processes proposed for exercise by Marcus et al. (1992), were those originally designed for smoking cessation by Prochaska and DiClemente (1983). It is possible that the processes used to change a negative behavior may not be relevant for adopting a health protective behavior. For example, counter conditioning (i.e., the substitution of alternative behaviors for the problem behavior) does not seem to pertain to exercise, as the problem behavior is not engaging in exercise. Likewise, an individual's choice to not engage in exercise (e.g., the problem behavior) does not effect the physical environment (as it would in smoking), as suggested by environmental reevaluation. According to the Canadian Fitness and Lifestyle Research Institute (1996), the most common barriers to exercise reported by Canadians aged 18-24 were: lack of time/ too busy, lack of energy/ too tired, and lack of motivation. Perhaps processes which modify these barriers (e.g., time management and goal setting) may prove more effective in facilitating stage progression than the ones currently employed for exercise.

As well, there is the potential that all participants (including the controls) were exposed to some experiential and behavioral processes of change (e.g., consciousness raising, self-reevaluation, and/or self-liberation) simply by answering questions about

exercise. This may have prompted individuals to examine their current exercise beliefs and behavior; thereby, influencing the results.

Since the two interventions were designed to present different information (i.e., precontemplation/contemplation intervention presented pros of exercise, and the preparation intervention presented strategies to increase self-efficacy), participants were asked to evaluate the interventions on whether they learnt any additional benefits of exercise that they did not previously know, and whether they learnt any additional strategies/techniques that would help them make vigorous exercise a more regular part of their lifestyle. Results of the ANOVA for both measures indicated a Stage x Condition interaction. This seems to show support for the effectiveness of the interventions in presenting different types of information (i.e., content); however, this may be misleading.

Closer examination of the group means shows that participants who received the self-efficacy/planning intervention (i.e., mismatched precontemplators/contemplators, and matched preparers) indicated that they learnt few or some additional benefits of exercise, even though the intervention they received did not present any benefits. Similarly, participants who received the pros intervention (i.e., matched precontemplators/contemplators, and mismatched preparers) indicated that they learnt few or some additional strategies/techniques, although none were presented to them. Perhaps some participants view consciousness raising (e.g., providing benefits of exercise) as a strategy for increasing exercise behavior. If this were the case, then the interventions presented would not have differentially manipulated the information required for matched and mismatched conditions.

Methodological Issues. Participants in the present study may not have been truly representative of their stage, since eligibility criteria was based on frequency and duration of vigorous exercise. As a result, individuals could have participated in regular mild or moderate exercise, or even vigorous exercise less than three times per week, and still could have been classified as precontemplators/contemplators if they were not intending to change their vigorous exercise behavior in the next month. Results from the present study indicated that indeed, almost all participants reported having engaged in some form of exercise within the previous two weeks. Consequently, participants may not have been appropriately staged (which would affect the results). Additionally, previous exercise research has not used vigorous intensity in the classification of stages (moderate exercise is generally used) and therefore, the staging in the present study may have been artificially created.

It has been suggested (Dijkstra et al., 1998) that individuals who are in the precontemplation stage may benefit just as much from a stage-mismatched intervention as they would from a stage-matched intervention. For individuals who think about their behavior frequently or who have moved through some of the stages previously (and have regressed), a "how-to" intervention might prompt them to change their current behavior. Since these individuals have already gone through the early stages and likely possess the information needed to facilitate stage progression, a stage-matched intervention for the earlier stages may have little value, as individuals may only need the extra push of a "how-to" intervention (Dijkstra et al., 1998). As a result, "over-staging" a mismatched intervention (i.e., individuals at an early stage of change receive an intervention more appropriate for people at a later stage) may be more effective than "under-staging" (i.e.,

individuals at a later stage receive an intervention more appropriate for people at an earlier stage) since the latter strategy does not promote stage advancement (Quinlan & McCaul, 2000). Results of the present study support the premise that "over-staging" has value, as participants in precontemplation/contemplation who received the intervention stage-matched to preparation progressed in stage. There is the possibility however, that these findings may not be replicated if the stages used in creating the matched and mismatched interventions are further apart in the sequence of stages.

Future research might also want to examine the effect of presenting interventions that are matched to an individual's current stage of change with interventions that are matched to the individual's highest stage ever achieved. For example, if an individual attempts to reach a particular stage and fails (e.g., action), the individual likely had incorporated the knowledge and strategies required to successfully reach the stage prior to the one they failed at (e.g., preparation). Since individuals already possess the knowledge required to get them to this stage, they may actually be matched to their highest stage achieved, and an intervention designed for an earlier stage (e.g., the individual's current stage) may not be truly matched.

As was mentioned earlier, control participants demonstrated large changes in stage when no intervention was provided to them. It was suggested that improvements could have been due to a demand awareness effect, or that simply answering questions about exercise may prompt individuals to consider their current exercise beliefs and behaviors. It is not unreasonable to assume that perhaps these factors also influenced participants in the mismatched conditions.

Qualifications

Several limitations should be considered when interpreting the results of the present study and planning future research. First, conclusions should be limited to the transtheoretical model and exercise. Other stage-matched theories or behaviors may produce different results regarding the effects of stage-matching and stage-mismatching (see Weinstein et al., 1998a). In addition, findings are only representative of two stage transitions, from precontemplation/contemplation to preparation, and from preparation to action. Future studies should attempt to examine other stage transitions. Second, the findings are not generalizable beyond young, healthy undergraduate students. Results from the present study may have depended on particular attributes of the sample selected. Participants were young (M age = 19.4), predominantly female (72%), and almost all indicated that that they had participated in some form of exercise (e.g., mild, moderate, or strenuous) within the previous two weeks. Future research should utilize various populations (e.g., truly sedentary sample and/or older adults) to determine if different results would be produced. A third limitation is that the self-report nature of the study creates the potential for methodological limitations due to the risk of over-reporting socially desirable activity levels (which could lead to misclassification of stage). Finally, follow-up measures were taken two weeks after delivery of the intervention. It is possible that transitions between stages could occur quickly (Weinstein et al., 1998b) and that at post-intervention (i.e., two weeks later) the effects of the intervention were non-existent, or it may be that transitions need more time to develop (see Prochaska et al., 1993). With respect to the present study, there is the possibility that an additional follow-up six months post-intervention might produce different results than those at two weeks post-

intervention, as possible effects of measurement may be diminished (e.g., participants likely will not have been recently reminded about exercise). Future studies should alter the length of the follow-up period to see if different results would be produced.

Conclusion

The implementation and evaluation of stage-matched interventions is receiving increased attention across various health behaviors. The present study attempted to evaluate the efficacy of stage-matching interventions to an individual's stage of change by examining stage progression, vigorous exercise behavior, and intervention effects on and hypothesized mediators of change. Support for the transtheoretical model was indicated, as changes in cognitive mediators resulted in stage progression. However due to a number of issues, the experiment was unsuccessful in differentially manipulating the processes of change based on "stage-matched" and "stage-mismatched" interventions.

If interventions are accurately matched and mismatched to an individual's stage of change, then a comparison of the two interventions allows for a more rigorous test of the stage framework, and of the notion that different information is important at different stages. Future research might also want to examine how stage-matched interventions affect hypothesized mediators of change for exercise. To help maximize the effectiveness of future interventions for exercise, further examination of stage-matching is required.

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## Appendix A

## Transtheoretical Model: Empirical Review Table

| Authors | Sample | Design | Assessment/ Measures | Results |
|---|---|---|---|---|
| Armstrong et al. (1993) | 401 adults | Longitudinal | 2 year follow-up mail survey; Examined the adoption of vigorous exercise in precontemplators and contemplators; Demographics; Stage of Change for exercise (SOC); Self-efficacy (SE); Vigorous exercise (EX). | Contemplators had higher baseline SE than precontemplators; Contemplators reported more vigorous EX at 6-months post-baseline; SOC was significant predictor of future adoption of EX and approx. of equal magnitude with SE. |
| Barke & Nicholas (1990) | 59 older adults, aged 59-80 | Descriptive/ Cross-sectional | In-person interview; SOC; Between-subjects comparison of active versus inactive groups. | More active participants in action and maintenance stage than inactive; more inactive in precontemplation. SOC distinguishes older adult groups who vary in activity levels. |
| Bock et al. (1998) | 194 sedentary adults | Intervention | Examined the relationship between readiness to change exercise and motivation to change dietary behavior and smoking status; Mailed questionnaire; Exercise behavior; SOC; Decisional balance; Self-efficacy; POC. | Readiness to adopt exercise was positively associated with readiness to reduce dietary fat and healthy eating behaviors, but not differentially associated with readiness smoking status. |
| Booth et al. (1993) | 4404 Australian adults | Cross-sectional | SOC; Sociodemographic characteristics; Benefits of exercise. | Systematic relationship b/w SOC and reported activity; Lower stages, less likely to endorse benefits of EX; Higher education, less likely to be in lower stages; Frequency and intention for Ex decreased with age. |
| Bull et al. (1999) | 272 adult primary care patients | Intervention | Compared tailored & personalized materials vs. general to personalized vs. general & not personalized vs. control SOC; Leisure-time physical activity (LTA); Physical activities of daily living (PADL). | Patients in the tailored group more likely to increase PADL than other groups, and less likely to be doing fewer PADL at follow-up; No significant differences for LTA. |
| Buxton et al. (1994) | 182 (102 M, 80 F) university employees | Cross-sectional | SOC; SE; Perceived physical conditioning; EX intensity, VO2max. | Best discriminatory variables were: Females: perceived physical conditioning, VO2max, hard activity. Males: perceived physical conditioning, SE; Concurrent validity and measurement reliability were demonstrated. |

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| Calfas et al. (1997) | 212 healthy, sedentary adult patients | Intervention | Baseline/ intervention/ 2-week follow-up; Demographics; 7-day physical activity recall; SOC; SE for exercise, Social support for activity; Processes of change (POC); Construct validity of intervention. | Intervention subjects significantly increased activity; Behavioral & cognitive POC increased significantly in intervention group compared to control; No identifiable primary mediator of change in activity; Strongest mediators are behavioral POC and SE; Limited support for construct validity. |
| Cardinal (1995) | 14 adults (8 F & 6 M) | Descriptive | Evaluated 2 exercise promotion written materials (lifestyle & structured EX) tailored to stage; used a modified version of Educational Materials Review Form. | No significant differences were observed. |
| Cardinal (1997a) | 235 adults | Cross-sectional | Demographics; SOC; Body mass index; VO2max; Ex behavior; Relapse; Barriers; SE. | Stage of Ex differed significantly and meaningfully on all seven outcome measures; General linear pattern of improvement across stages; Age, marital status, and race/ethnicity were significantly related to stage. |
| Cardinal (1997b) | 47 F clerical worksite employees | Prospective | Baseline, 1-month and 7-month assessments; Demographics; SOC; EX behavior. | No significant differences b/w baseline SOC and 7-month post-baseline; Education, body mass index and initial stage explain significant proportion of variance in stage improvement at 1-month; At 7-months, only significant predictor of stage improvement was baseline stage. |
| Cardinal et al. (1998) | 669 pre-adolescents (aged 5-11) | Cross-sectional | Demographics; SOC; Fitness; Ex beliefs; Ex knowledge. | SOC was significantly related to age, gender, and grade level; When controlling for these differences, SOC was significantly related to Ex beliefs. |
| Cardinal & Sachs (1995) | 113 Female university clerical employees | Intervention | SOC; Received one of three mail-delivered EX packets (i.e., lifestyle EX, structured EX, or Fitness feedback). | Dropout rate was unrelated to treatment group; Lifestyle EX packet group most likely to advance stage post-baseline; All interventions were effective. |
| Clarke & Eves (1997) | 393 middle-aged, sedentary adults | Cross-sectional | Demographics; SOC; Decisional balance; SE; EX barriers. | Pros of EX increased, whereas cons decreased across stages; Pros scale didn't differentiate b/w SOC; SOC was not significantly associated with SE; Specific barriers associated with different SOC. |
| Cole et al. (1998) | 1192 federal agency employees | Intervention | Modified SOC (included a late preparation stage) | More than a third (35.4%) of participants progressed one or more stages; SOC can serve as indicators of change process, which can be used as evidence of short-term effectiveness of interventions. |
| Courneya (1995a) | 270 older adults (aged 60+) | Cross-sectional | SOC; Perceived severity (PS): visibility, rate of onset, time of onset. | PS discriminated precontemplation from higher stages; PS discriminated preparation from higher stages; Effects of PS dimensions on SOC mediated by PS; Visibility strongest contribution to PS; Main function PS to motivate people to consider becoming active. |

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|---|---|---|---|---|
| Courneya (1995b) | 288 older adults (aged 60+) | Cross-sectional | Demographics; SOC; EX history; Control and behavioral beliefs; Attitude; Subjective norm; Perceived behavioral control; Intention. | Significant linear relationship b/w each Theory of Planned Behavior constructs and SOC; Every stage distinguishable from others exception action from maintenance; Important discriminators b/w stages were intention, attitude, and perceived behavioral control. |
| Courneya et al. (1997) | 147 older adults (aged 60+) | Prospective | Baseline mail survey; 3-year telephone follow-up; Demographics; Subjective norm; Attitude; Perceived behavioral control; Intention; EX stage (resisters, maintainers, adopters or relapsers). | Perceived behavioral control was only significant predictor of progression from resisters to adopters; Attitude, perceived behavioral control, and intention all significant predictors of regression from maintainers to relapsers; Support for TPB in prediction of progression and regression through SOC. |
| Courneya et al. (1998) | 131 older adults (aged 60+) | Longitudinal | Baseline mail survey; 3-year telephone follow-up; Subjective norm, attitude, & perceived behavioral control (Theory of Planned Behavior constructs); Intention; SOC; EX behavior. | TPB constructs significant predictors of SOC; Intention mediated effects of TPB constructs on SOC; EX behavior best predicted by behavior rather than stage. |
| Cowan et al. (1997) | 182 adult primary care patients | Cross-sectional | SOC; SE; Body mass index. | No significant association b/w body mass index and SOC; SE significantly higher among participants in action and maintenance compared to precontemplation. |
| Godin et al. (1995) | 347 adults | Prospective | In-person baseline questionnaire; 6-month follow-up; SOC; Global attitude; Global subjective norm; Perceived behavioral control; belief-based attitude; belief-based subjective norm; EX barriers; EX behavior (follow-up measure). | SOC corresponds to specific beliefs and attitudes; Perceived behavioral control important to transitions b/w SOC; EX behavior at follow-up supported predictive validity of all stages. |
| Gorely & Gordon (1995) | 583 Australian adults (aged 50-65) | Cross-sectional | SOC; POC; SE; Decisional balance. | Only 5 of 10 POC made significant contribution to predicting SOC; SE increased steadily and significantly from precontemplation to maintenance; Precontemplators have greater emphasis on cons, Maintainers emphasis on pros; POC, SE, and decisional balance important in differentiating SOC. |
| Hellman (1997) | 345 adults (aged 65+) with cardiac diagnosis | Cross-sectional | Computer-assisted telephone interview; SOC; EX behavior; Perceived health status; EX benefits/ barriers; EX behavior prior to cardiac event; SE; Interpersonal support; POC. | Significant predictors of EX adherence were perceived SE, perceived barriers, perceived benefits, and interpersonal support; Experiential processes and smoking status contributed to differentiation b/w precontemplation and contemplation; EX time significantly increased from precontemplation to maintenance. |

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|---|---|---|---|---|
| Herrick et al. (1997) | 393 government employees. | Cross-sectional | Demographics; SOC; Decisional balance; SE. | Significant differences for SE and decisional balance across SOC, but not b/w four health behaviors; Pros and SE higher, and cons lower, in action and maintenance compared to precontemplation and contemplation. |
| Jue & Cunningham (1998) | 253 coronary artery bypass graft post-surgical patients (aged 60+) | Prospective | Mail delivered questionnaires at 4 to 6 months, and 22 to 26 months post-surgery; Demographics; SOC; POC. | Participants in precontemplation and preparation used POC the least, while those in contemplation and action used them most; 67% finished in maintenance stage; intervention should focus on patients in earlier SOC. |
| Lee (1993) | 286 Australian women (aged 50-64) | Cross-sectional | Telephone interview; Demographics; SOC: EX knowledge, attitudes, and opinions; EX preferences and availability; EX recall. | Precontemplators generally older, had lower EX knowledge, lower family support, expected fewer psychological benefits, and rated EX less important than avoiding smoking; Contemplation differed from higher stages on perceived barriers; Older individuals typically at earlier stages. |
| Marcus, Banspach et al. (1992) | 610 adults (aged 18-82) | Intervention | Community-wide recruitment of non- and occasional-exerciser; Stage-matched intervention package included: written materials, community activity opinions & organized EX activity nights; Follow-up 3-weeks post-intervention (n= 236); Demographics; SOC; EX behavior. | Subjects were significantly more active after intervention; 30% of contemplators at baseline, and 61% in preparation, advanced to action after 6-weeks intervention; 30% of baseline contemplators had progressed to preparation. |
| Marcus, Eaton, et al. (1994) | 698 M & F worksite employees | Cross-sectional & Longitudinal (3-step model-building) | SOC; SE; Decisional balance; EX behavior. | Level of EX predicted by SOC, pros and cons of EX, and SE for EX; SE strongly related to intention, which is a strong predictor of EX 6 months later; High pros, low cons, and high SE related to activity only indirectly, through mediation of stage. |
| Marcus et al. (1998) | 1559 worksite employees | Intervention | Intervention at baseline and 1-month, assessments at baseline and 3-months; SOC; EX behavior. | Stage-matched approach resulted in significantly greater progression, and less stability and regression in motivation to adopt EX than standard intervention; No significant difference b/w interventions for those in maintenance; support for treatment approaches that tailor interventions to individual's SOC. |
| Marcus & Owen (1992) | Study (1)1093 M & F USA worksite employees; (2) 801 Australian worksite employees | Cross-sectional | SOC; SE; Decisional balance. | SE and decisional balance significantly related to SOC; Precontemplators significantly different from other stages; Proportion of individuals in each stage similar across both samples. |

| | | | | |
|---|---|---|---|---|
| Marcus, Pinto et al. (1994) | 431 F worksite employees | Cross-sectional | SOC; SE; Decisional balance; EX behavior | Demographics generally not related to SOC (exception: women with children under at home, married women); SE and decisional balance related to SOC; Precontemplators scored lowest, and maintainers highest, on SE, pros, and decisional balance, trend reversed for cons |
| Marcus, Rakowski et al. (1992) | 778 M & F worksite employees | Cross-sectional | SOC; Decisional balance. | Pros, cons, and decisional balance significantly associated with SOC; Pros increased, and cons decreased, linearly across SOC. |
| Marcus, Rossi et al. (1992) | 1172 M & F worksite employees | Cross-sectional | Sample divided in half for initial development of questionnaire and for cross-validation; Demographics; SOC; POC. | Two hierarchical-factors were supported: experiential and behavioral; SOC related to POC usage; Precontemplators used all 10 POC less than other stages; Use of experiential processes peak in action; Behavioral processes generally increased from precontemplation to action, then leveled off. |
| Marcus, Selby et al. (1992) | Study: (1) 1063 government employees; (2) 429 medical center employees; (3) 20 medical center employees | Cross-sectional | Study: (1) Demographics; SOC; SE<br>(2) Same as 1, with refinements<br>(3) Same as 2, with 2-week follow-up | SE differentiated SOC; Precontemplators scored lowest, maintainers highest, on SE; No significant relationship b/w demographic variables and SOC or SE; Test-retest reliability for SE scale was strong. |
| Marcus & Simkin (1993) | 235 M & F worksite employees | Cross-sectional | SOC; EX behavior. | EX behavior significantly differentiated SOC; Subjects in action/maintenance reported significantly more vigorous and moderate EX than in precont./cont.; Preparation reported more vigorous and moderate EX than precont./cont; Action/maintenance differed from preparation in vigorous EX. |
| Marcus et al. (1996) | 314 M & F worksite employees | Prospective | Baseline, 6-month follow-up; Demographics; SOC; POC. | Use of POC remained stable for those who didn't change EX behavior; Use of POC increased for those who adopted EX, and decreased for those who relapsed form EX; Social liberation only process didn't increase significantly for adopters; All behavioral processes, but only one cognitive POC (dramatic relief) decreased significantly for relapsers. |
| Mullan & Markland (1997) | 314 M & F worksite employees | Cross-sectional | SOC; Self-determinism. | Participants in later SOC more self-determined than in earlier SOC; Self-determination increased from precontemplation to maintenance. |
| Mummery & Spence (1998) | 1240 (1995 sample) and 1206 (1997 sample) residents of Alberta (aged 18+) | Cross-sectional | Telephone interview; SOC. | 52% of participants were regularly active in 1995; 55% in 1997. |

| | | | | |
|---|---|---|---|---|
| Murphy (1993) | Group: (1) 303 working adults (aged 18-64; (2) 331 older adults (aged 65+) | Cross-sectional | Mail-delivered; Phase 1 assessed SOC and POC; Phase 2 assessed intention, EX behavior, step test; One-month follow-up. | SOC construct supported; 4 POC used by both groups: self-reevaluation, helping relationships, counter conditioning, stimulus control; Working group also used consciousness raising and dramatic relief; Similar method of progression through the stages; All 4 approaches to classification of EX showed high congruence with SOC. |
| Nguyen et al. (1997) | 2269 M (aged 30-60 years) | Cross-sectional | Mail delivered questionnaires; Demographics; SOC; EX behavior; Intention; Attitude; Subjective norm; Perceived behavioral control; | Attitude, subjective norm, and perception of health status has strong associations with some stages and weak with others; Perceived behavioral control significant in all SOC; Combining SOC and TPB can provide more detailed results than when used alone. |
| Nigg & Courneya (1998) | 819 high school students | Cross-sectional | Demographics; SOC; POC; SE; Decisional balance. | All constructs differed significantly across stages; Results generally support applicability of transtheoretical model to adolescents. |
| Pinto & Marcus (1995) | 217 college students | Cross-sectional | Mail delivered questionnaire, Demographics (gender, year in school, place of residence); Modified SOC; EX behavior. | No significant difference b/w gender and year across SOC; 46% of students were inactive or exercising irregularly |
| Potvin et al. (1997) | 4768 inner city, suburban and rural residents | Cross-sectional | Demographics; SOC; Intention. | Rural twice as likely to be in action; Residents of suburbs mostly in preparation; Inner city more likely in precontemplation and contemplation; Suggests that type of community is related to readiness for vigorous physical activity involvement. |
| Prochaska et al. (1994) | 717 worksite employees | Cross-sectional | Assessment for 12 problem behaviors; SOC; Decisional balance. | Cons outweigh pros in precontemplation, opposite in action, crossover in contemplation or preparation (occurs in prep. for EX); support for generalizability of transtheoretical model across behaviors and populations. |
| Reed et al. (1997) | Study: (1) 936 worksite employees; (2) 19212 members of a New England HMO; (3) adult New Englanders. | Descriptive | Comparison of 8 algorithms using different descriptions of stage, definitions of EX, and response formats. | Good algorithm should clearly describe SOC and use complete definitions of EX including frequency, intensity, and duration; 5-choice and true/false response produce equal results. |
| Sonstroem (1988) | 220 M (aged 30+) | Prospective | SOC. | EX maintenance best studied as other than an all-or-none phenomenon; Dropouts represent several subsets of people, of whom, some intend to and do return to EX. |

| | | | | |
|---|---|---|---|---|
| Wyse et al. (1995) | 244 young British adults (aged 16-21) | Cross-sectional | SOC; EX behavior; SE; Body composition. Physical self-perception; Global self-esteem. | Differences b/w SOC clearly defined on basis of strenuous and moderate EX; Significant differences in SOC for EX SE, physical self-perception subdomains, and global self-esteem; Support for concurrent validity of the SEBC scale for self-report of EX behavior. |

## Appendix B

## Stage-Matching Across Health Behaviors: Empirical Review Table

| Authors | Sample | Design | Assessment/ Measures | Results |
|---|---|---|---|---|
| Prochaska et al. (1993) | 756 smokers | Intervention | 4 interventions: 1) standardized self-help manuals, 2) stage-matched manuals; 3) expert system plus matched manuals; 4) personalized condition which included materials from 2 and 3 plus counselor calls;<br>SOC; POC; Decisional balance; SE: Temptation; Smoking status; Demographics; Point prevalence abstinence; Prolonged abstinence; Cotinine validation. | Expert system's groups more than doubled standardized group on abstinence measures; Standardized and stage-matched conditions were equivalent at 12 months, but stage-matching was more effective at 18 months; Expert system was the best at all follow-ups at all SOC. |
| Pallonen et al. (1994) | 265 middle-aged Finnish men (smokers) | Intervention | Modified SOC (precont., cont., preparers); 7-day point prevalence abstinence; Prolonged abstinence; Probability of stage changes at 1- and 2-year surveys; Exposure & subject evaluation of intervention. | Those receiving stage-matched manuals quit smoking and made more quit attempts than those not receiving the manuals. |
| Ruggiero et al. (1997) | 42 pregnant smokers | Intervention | Components included stage-matched self-help manuals; stage-matched counseling; expert system individualized feedback;<br>Examined feasibility, acceptability, perceived usefulness of components. | Findings indicate strong support for the feasibility, acceptability, perceived usefulness of the stage-matched intervention components. |
| Werch (1997) | 460 disadvantaged urban youth | Intervention | Provided in 6$^{th}$ grade, and again as booster in 7$^{th}$; Stage-matched written materials, nurse consultation, weekly family-based prevention lessons.<br>Expanded SOC; Youth, alcohol and drug survey. | Stage-based STARS for families (Start Taking Alcohol Risks Seriously) program has promise based on pilot study. |
| Dijkstra et al. (1998) | 1540 smokers | Intervention | Received 1 of 4 conditions (matched or mismatched): 1) outcome information; 2) self-efficacy enhancing info; 3) both 1 & 2; 4) no info. Modified SOC; Decisional balance; SE; Intention; Smoking behavior; Demographics; Point prevalence abstinence. | Compare with no info group: conditions 1 & 3 led to more stage transitions for immotives; conditions 2 & 3 led to more stage transitions for precont; cont. benefited the most from both sets of info; preparers from SE info only. |

| | | | | |
|---|---|---|---|---|
| Rakowski et al. (1998) | 1397 women patients of an HMO aged 40-74. | Intervention | Conditions: no educational materials; standard materials; stage-matched materials; SOC; POC; Decisional balance; Number & recency of prior mammograms; Demographics. | Stage-matched materials had higher rates of screening than no materials group; Standard materials group was intermediate between other two groups; Standard group did not differ from no materials group, but did differ from stage-matched group in multivariate analysis. |
| Weinstein et al. (1998) | 1897 adult smokers | Intervention | Used matched and mismatched conditions; SOC; Purchase of radon test kit. | Risk treatment was more effective in getting undecided people to decide to test than in getting decided-to-act people to order; Low effort intervention more effective in getting decided-to-act people to order than in getting undecided people to order. |
| Velicer et al (1999) | 2882 smoking members of a managed care system | Intervention | Interactive vs. noninteractive intervention; Treatments were delivered in 1 of 4 doses: 1,2,3, or 6 months at 3-month intervals; SOC; POC; Decisional Balance; Situational temptations; Smoking history; Demographics. | Interactive (expert system/ computer feedback) intervention outperformed a noninteractive (stage-matched manuals) intervention under 4 different contact conditions; No dose-response relationship emerged; Proactive stage-matched interventions can produce high participation rates. |
| Quinlan & McCaul, (2000) | 92 college-aged daily smokers in the precontemplation stage | Intervention | Compared stage-matched vs. mismatched design; SOC; POC; Decisional Balance; Smoking status-stage; Intention and motivation; Smoking behavior and history. | Results failed to support the value of matching interventions to a smoker's SOC; More smokers who received the mismatched intervention increased in stage than participants in the matched condition. |

## Appendix C

## Stage-Matching in Exercise: Empirical Review Table

| Authors | Sample | Design | Assessment/ Measures | Results |
|---|---|---|---|---|
| Marcus, Banspach et al. (1992) | 610 adults (aged 18-82) | Intervention | Community-wide recruitment of non- and occasional-exerciser; Stage-matched intervention package included: written materials, community activity opinions & organized EX activity nights; Follow-up 3-weeks post-intervention (n= 236); Demographics; SOC; EX behavior. | Subjects were significantly more active after intervention; 30% of contemplators at baseline, and 61% in preparation, advanced to action after 6-weeks intervention; 30% of baseline contemplators had progressed to preparation. |
| Cardinal (1995) | 14 adults (8 F & 6 M) | Descriptive | Evaluated 2 exercise promotion written materials (lifestyle & structured EX) tailored to stage; used a modified version of Educational Materials Review Form. | No significant differences were observed. |
| Cardinal & Sachs (1995) | 113 Female university clerical employees | Intervention | SOC; Received one of three mail-delivered EX packets (i.e., lifestyle EX, structured EX, or fitness feedback). | Dropout rate was unrelated to treatment group; Lifestyle EX packet group most likely to advance stage post-baseline; All interventions were effective. |
| Calfas et al. (1997) | 212 healthy, sedentary adult patients | Intervention | Baseline/ intervention/ 2-week follow-up; Demographics; 7-day physical activity recall; SOC; SE for exercise, Social support for activity; Processes of change (POC); Construct validity of intervention. | Intervention subjects significantly increased activity; Behavioral & cognitive POC increased significantly in intervention group compared to control; No identifiable primary mediator of change in activity; Strongest mediators are behavioral POC and SE; Limited support for construct validity. |
| Marcus et al. (1998) | 1559 worksite employees | Intervention | Intervention at baseline and 1-month, assessments at baseline and 3-months; SOC; EX behavior. | Stage-matched approach resulted in significantly greater progression, and less stability and regression in motivation to adopt EX than standard intervention; No significant difference b/w interventions for those in maintenance; support for treatment approaches that tailor interventions to individual's SOC. |
| Bull et al. (1999) | 272 adult primary care patients | Intervention | Compared tailored & personalized materials vs. general to personalized vs. general and not personalized vs. control; SOC; Leisure-time physical activity (LTA); Physical activities of daily living (PADL). | Patients in the tailored group more likely to increase PADL than other groups, and less likely to be doing fewer PADL at follow-up; No significant differences for LTA. |

APPENDIX D

# WHY SHOULD I EXERCISE?

Insufficient participation in regular moderate exercise is known to shorten the life span, increase morbidity, and undermine quality of life and general well-being (Bouchard, Shepard, & Stephens, 1994). There are many benefits, both physical and psychological, to be gained through participation in regular exercise. The goal of this package is not to get you to start an exercise program, but to prompt you to consider your current exercise habits and the consequences associated with your level of physical exercise.

## REASONS TO ADOPT EXERCISE

Physical exercise can enhance disease resistance. It strengthens the immune system, which provides resistance to infectious diseases of all kinds. Regular exercise can provide protective benefits for cardiovascular disease, many types of cancer, and non-insulin dependent diabetes mellitus (Brehm & Iannotta, 1998).

Diseases of the cardiovascular system are the leading cause of death for both men and women (Gunby, 1992). Research suggests that exercise prevents or at least significantly postpones cardiovascular disease. Exercise helps to prevent or control a number of important factors that increase risk for cardiovascular disease in both men and women including hypertension, non-insulin dependent diabetes mellitus, high-risk blood lipid profile, and excess body fat (Caplan, 1993; Manson, 1991; Young, 1993).

Exercise can benefit the cardiovascular system by decreasing resting heart rate, lowering blood pressure, increasing stroke volume from the heart, and can lead to greater physical work capacity. Exercise can also improve your blood cholesterol level.

Specifically, your high-density lipoprotein (HDL) level increases with exercise. Having a higher HDL level is good because HDL carries cholesterol away from your blood vessels. If allowed to stay in your blood vessels, cholesterol can cause blockages, which can lead to a heart attack or stroke (Rippe, Blair, Freedson, La Porte, Morgan, et al., 1987).

Many researchers believe that exercise protects against breast, ovarian, and endometrial cancer by decreasing a woman's lifetime exposure to estrogen (Kramer & Wells, 1996). Additionally, exercise is associated with reduced risk of colon cancer for both men and women (De Verdier, 1990) and prostate cancer in men. Researchers have also hypothesized that physical exercise may decrease cancer risk in general by increasing natural immunity (Høffman-Goetz & MacNeil, 1992).

Participating in exercise can contribute to weight control. It can reduce fat tissue and increase lean tissue (muscle mass) (Willis & Campbell, 1992). Thus, decreasing your risk for many diseases, including obesity. Additionally, exercise can promote sleep (Youngstedt, 1997).

Activities that place more stress on the musculoskeletal system may lead to greater bone density. Numerous studies support the importance of physical exercise for development of maximal bone density in young adulthood and the delay of bone mineral loss (osteoporosis) during middle- and old-age (Greendale, 1995). Participating in exercise can improve strength and balance, which may prevent falls that lead to fracture (Nelson, 1994), and can contribute to functional independence in old age (Greendale, 1995).

For many people, the social aspects of exercise are an important reason for their participation. Social reasons for exercise range from meeting new people, to fighting loneliness and social isolation. Participating in group exercise often leads to friendship among regular participants, as opportunities for socializing occur before, during, and after participation. People derive social support from others, and may feel a greater sense of personal commitment to continue (Willis & Campbell, 1992).

Exercise can be fun and enjoyable. Most people engage in physical exercise over a long period of time because they have found something that gives them a sense of fun or happiness. A person may reap the health benefits of exercising, while experiencing the pleasurable aspects of activity.

There are many psychological benefits that can be gained through participation in exercise as well. Exercise has been shown to help cope with stress, and can provide improvements in levels of tension and anxiety, mood, depression, psychological well-being, self-esteem and body image (Willis & Campbell, 1992).

Physical exercise can act as a catharsis or a means of releasing tension and pent-up emotions, and it provides a distraction or diversion from anxiety-producing stimuli. Exercise can elevation mood during and immediately after exercise, which may account for the extraordinary commitment and long-term involvement of many people (Willis & Campbell, 1992). Exercise can also be a form of meditation (Willis & Campbell, 1992). A feeling of deep physical relaxation commonly follows vigorous exercise, which is usually accompanied by mental relaxation as well. (Morgan, 1985). As well, improvement in fitness can result in perceptions of control and mastery, which leads to feelings of well-being and self-esteem (Willis & Campbell, 1992). The psychological

benefits that can be reaped from participation in regular exercise contribute greatly to the quality of daily life (Brehm & Iannotta, 1998).

Exercise in not just good for your physical health, but for your mental health as well! Overall, there are over **50 different benefits** of vigorous exercise that have been documented by scientific research. This package was designed to help you examine the benefits associated with increasing your level of exercise. **Now it's up to you to decide if you want to think about becoming more vigorously active.**

APPENDIX E

# PLANNING TO EXERCISE

When planning to exercise, there are a number of important factors that require consideration. Individuals need to examine roadblocks which prevent them from exercising, and find solutions/ strategies to overcoming these barriers. When people have a definite goal that they strongly desire to achieve (e.g., to become a regular exerciser), they will actively seek ways to reach that goal. Goal setting is an effective means of increasing motivation, and provides individuals with direction. Lastly, the development of a specific plan of action facilitates goal attainment. The purpose of this guide is to help you start to make vigorous exercise a more regular part of your lifestyle.

There are many obstacles which people may encounter when planning or beginning an exercise program. A recent national Canadian survey (Canadian Fitness and Lifestyle Research Institute, 1996) highlighted the most common barriers to exercise reported by Canadians aged 18-24 as: (1) lack of time/ too busy, (2) lack of energy/ too tired, and (3) lack of motivation/ desire. Additionally, lack of access to facilities and/or equipment, and the possibility of injury can prevent individuals from engaging in exercise. Following are suggestions for addressing these common reasons for not exercising.

Lack of time is by far the most frequently cited reason for not exercising. However, having no time for exercise is often more of a perception than a reality (Willis & Campbell, 1992). Few people are scheduled so tightly that they cannot work in some time for exercise. Examining your time management skills may help you find the 'extra' time that you need to exercise. When you think about the amount of time that you spend watching T.V., talking on the phone, or playing on the computer, finding that 'extra' time for exercise may not be as hard as you thought. Consider: combining exercise with other activities (e.g., while reading/studying or watching T.V.), using exercise as a means of transportation (e.g., to and from school), exercise during your lunch break, exercise twice on the weekend so that you only have to do it once during the week, or wake up 30 minutes earlier or go to bed 30 minutes later. Make exercise a priority. Schedule it into your day, rather than waiting to see if it fits in.

Being too tired is the second most common reason for not exercising. Many individuals think that they don't have the energy required for exercise. You may be surprised to discover that once you overcome the initial hurdle and begin to exercise, you will have more energy. Your body learns to adapt by becoming more able to perform exercise after each session, and you will likely find that other activities required for daily living will seem easier. If you find that you are too tired at the end of the day to exercise, then try doing it before you go to school or earlier in the day. If you are not a morning person, then perhaps try exercising in the evening. Do what works best for you. Use exercise as a study break and as a means to re-energize yourself, or try setting exercise goals that you want to accomplish each week to help keep you motivated.

The thought of exercising may not excite many individuals. It is often construed as boring. Therefore, people need to find ways to make it more enjoyable. Working out with a partner or partners can help motivation and adherence. It can give you someone to talk to and provide that extra support that you may need to continue your exercise program. A change of scenery can also provide some new excitement. Instead of riding on a stationary bike, try riding through the river valley. Taking a new route will give you new things to look at and is likely to keep you more distracted, and not as focused on the actual performance of exercise. Use exercise as a means of transportation (e.g., to school/work) therefore, giving it purpose. Exercising while doing other activities (e.g., listening to music, watching T.V.) can make your exercise session more enjoyable.

How you view exercise can also affect your interest level. Running and biking are not the only forms of vigorous exercise. If you enjoy team sports (e.g., volleyball or basketball) then play, but play hard. Individual sports (e.g., swimming or squash) also provide opportunities to participate in exercise. Choose activities that you enjoy doing, and try varying your workout to keep exercise interesting.

People often claim that they cannot exercise because they have no access to facilities and/or equipment. The cost of joining a gym or purchasing your own equipment can be very high. However, there are other activity options at your disposal, such as walking, running or riding your bike for exercise. Have you considered using the local gym at your university (you have already paid for membership through your tuition) or joining an intramural or community league team. Many facilities (including the

university) offer drop-in passes which are cheaper than enrolling in programs. Utilizing your local swimming pools, squash courts, etc. also provide a less expensive alternative for exercise participation. There are many opportunities for participating in exercise out there; you just have to look for the possibilities in your own particular situation.

It is very likely that you may get sore muscles when you first become more active. However, most muscle soreness can be avoided by stretching both before and after exercise. It is also important to remember the rule of progression: start out slow and then gradually work harder as your body adapts and your fitness increases. This will decrease your chance of injury, and you are more likely to 'stick with it' as you are not as sore. Many injuries that occur during exercise can be avoided by using proper equipment and methods. Don't be afraid to ask for help (from a qualified individual) if you need it.

**GOAL SETTING** (Locke & Latham, 1995)

When people have a definite goal that they strongly desire to achieve (e.g., to become a regular exerciser), they will actively seek ways to reach that goal. Here are some points to keep in mind when setting goals (Locke & Latham, 1995):

- Specific goals (e.g., bike for 15 minutes, 3 times per week) are much more effective than general goals (e.g., do your best).
- Challenging goals result in better performance than moderate or easy goals. Goals should be realistic for an individual based on factors such as age, physical condition and interests.
- Use short-term or intermediate goals to help attain difficult or long-term goals. By setting intermediate goals such as exercising 3 times this week, a person can see incremental progress toward a long-range goal such as becoming a regular exerciser.
- The development of a strategy or plan of action facilitates goal attainment.
- 5 steps for productive goal setting:
  1. Specify the objective or tasks to be done.
  2. Determine how progress toward the goal will be measured.
  3. Specify the standard to be reached.
  4. Specify the time period in which to reach the goal.
  5. Prioritize goals.

## PLANNING TO GET STARTED (Project Pace)

What are the two main benefits you hope to get from exercising?

Write them down here and think of them often.

1. _____

2. _____

**Exercise must be regular**. Plan to do a vigorous activity of your choice at least **3 times per week**.

### WHAT TYPE OF EXERCISE ARE YOU GOING TO DO?

Some examples of vigorous exercise enjoyed by many people are listed below.

- Jogging
- Aerobic dance
- Basketball
- Fast cycling
- Cross-country skiing
- Swimming laps
- Racquet sports
- Soccer

In choosing the type(s) of exercise you will participate in, consider these questions:

- *Do you enjoy it?* Can you afford the supplies, equipment, facilities, or classes? Are there family or friends who will exercise with you? Can you do it year-round or do you need more than one activity?

  *Type(s) of exercise*:

  _____

  _____

- *Where will you exercise?* Can you exercise at home or in your neighborhood? Do you have to go to a gym, a park, or a health club? Is this place convenient for you?

  *Place(s) for exercise session*:

  _____

  _____

- *What is the most realistic time for you to exercise three or more times per week?* Will you have to reschedule other activities?
  *Days and times for exercise*:

  _____

  _____

- *How long do you plan to exercise each time?* Build up time gradually over several weeks. Start with a 5- to 10-minute workout and build up to 20 to 40 minutes of vigorous exercise.
  *Length of exercise session*:

  _____

  _____

- *Who can support you with your new exercise program?* It is ideal for someone to exercise with you. You may want to ask someone to encourage you or help you to exercise.
  Who will help you and how:

  _____

  _____

The next step is to develop your own program.

**Suggested Program (FITT)**

**Frequency:** _____ times per week
**Intensity:** ___ vigorous ____ exercise
**Type:** _____ type exercise
**Time:** _____ minutes per session to begin
(work up to _____ minutes in _____ weeks)

I agree to try out this exercise plan from _____ to_____.

_____ _____

Your signature Date

Each time you meet one of your exercise goals, reward yourself for doing a good job. For example, you might: go out to a movie, go out for dinner, buy yourself something, or go out with your friends. Reward yourself by doing anything that you consider a treat.

**Now that you have completed your plan to become more vigorously active, the next step is to put your plan into action. Good Luck!**

# APPENDIX F

The following question asks you about your present exercise behavior. Select the one statement that best describes your current exercise pattern. Vigorous exercise is defined as any planned, organized, and repetitive (continuous) physical exertion aimed at improving or maintaining aerobic or muscular physical fitness and health. Regular exercise is defined as exercising for at least 30 minutes, 3 times or more per week and intense enough to work up a sweat and/or cause heavy breathing.

_____ I currently do not engage in regular vigorous exercise and I am not seriously considering starting in the next six months.

_____ I currently do not engage in regular vigorous exercise but I am seriously considering starting in the next six months.

_____ I currently do not engage in regular vigorous exercise but I intend to start in the next month.

_____ I currently engage in regular vigorous exercise but I have only begun to do so within the last six months.

# APPENDIX G

Select the answer that best describes your current views regarding exercise. Please remember that regular exercise is defined as any planned, organized, and repetitive (continuous) physical exertion aimed at improving or maintaining aerobic or muscular physical fitness and health, and intense enough to work up a sweat and/or cause heavy breathing, and is participated in for at least 30 minutes, 3 times or more per week.

---

1. I would have more energy for my family and friends if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

2. Regular exercise would help me relieve tension and anxiety.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

3. I would feel more confident if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

4. I would sleep more soundly if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

5. I would feel good about myself if I kept my commitment to exercise regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

---

6. I would like my body better if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

7. It would be easier for me to perform routine physical tasks (e.g., climbing a flight of stairs) if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

8. I would feel less stressed if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

9. Physical exercise would decrease my chance of developing cardiovascular disease.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

10. Physical exercise would decrease my chance of developing many types of cancer.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

11. Regular exercise would help me have a more positive outlook on life.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

12. Participating in physical exercise will help with independence in old age.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

13. Participating in regular exercise would benefit my psychological health.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

14. The social aspects of exercise are important to me.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

15. Exercise can be fun and enjoyable.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

16. I think that I would be too tired to do my schoolwork after exercising.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

17. I would find it difficult to find an exercise activity that I enjoy that is not affected by bad weather.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

18. I have no place where I can exercise.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

19. Regular exercise would take too much of my time.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

20. I would have less time to go out with friends if I exercised regularly.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

21. The cost of participating in regular exercise is more than I can afford.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

22. There is no one who would support me if I decide to exercise.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

23. I worry about what others might think or say about me while I am exercising.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

24. Exercise is boring.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| strongly disagree | disagree | neutral | agree | strongly agree |

Appendix H

For this next set of questions, please tell us how frequently you perform or experience each of the following statements using the following scale.

| | 1 Never | 2 | 3 | 4 | 5 Repeatedly |
|---|---|---|---|---|---|
| 1. I recall information people have personally given me on the benefits of exercise | 1 | 2 | 3 | 4 | 5 |
| 2. I think about information from articles and advertisements on how to make regular exercise part of my life | 1 | 2 | 3 | 4 | 5 |
| 3. I read articles about exercise in an attempt to learn more about it | 1 | 2 | 3 | 4 | 5 |
| 4. I look for information related to exercise | 1 | 2 | 3 | 4 | 5 |
| 5. Warnings about the health hazards of inactivity move me emotionally | 1 | 2 | 3 | 4 | 5 |
| 6. Dramatic portrayals of the health hazards of inactivity move me emotionally | 1 | 2 | 3 | 4 | 5 |
| 7. I react emotionally to warnings about an inactive lifestyle | 1 | 2 | 3 | 4 | 5 |
| 8. I feel I would be a better role model for others if I exercised more regularly | 1 | 2 | 3 | 4 | 5 |
| 9. I wonder how my inactivity affects those who are close to me | 1 | 2 | 3 | 4 | 5 |
| 10. I realize that I might be able to influence others to be healthier if I would exercise more | 1 | 2 | 3 | 4 | 5 |
| 11. Some of my friends might exercise more if I did | 1 | 2 | 3 | 4 | 5 |
| 12. I am considering the idea that regular exercise would make me a healthier, happier person to be around | 1 | 2 | 3 | 4 | 5 |
| 13. I think about the type of person I will be if I keep exercising | 1 | 2 | 3 | 4 | 5 |
| 14. I get frustrated with myself when I don't exercise | 1 | 2 | 3 | 4 | 5 |
| 15. I consider the fact that I would feel more confident if I exercised more regularly | 1 | 2 | 3 | 4 | 5 |
| 16. I find society changing in ways that make it easier to exercise | 1 | 2 | 3 | 4 | 5 |
| 17. I am aware of more and more people encouraging me to exercise these days | 1 | 2 | 3 | 4 | 5 |

| | 1 Never | 2 | 3 | 4 | 5 Repeatedly |
|---|---|---|---|---|---|
| 18. I notice that more businesses are encouraging employees to exercise by offering fitness courses and time off to work out | 1 | 2 | 3 | 4 | 5 |
| 19. I am aware that many health clubs now provide free baby-sitting services to their members | 1 | 2 | 3 | 4 | 5 |
| 20. Instead of remaining inactive, I engage in some activity | 1 | 2 | 3 | 4 | 5 |
| 21. Rather than viewing exercise as simply another task to get out of the way, I try to use it as my special time to relax and recover from the day's worries | 1 | 2 | 3 | 4 | 5 |
| 22. When I feel tired, I make myself exercise anyway because I know I'll feel better afterwards | 1 | 2 | 3 | 4 | 5 |
| 23. When I feel tense, I find exercise a great way to relieve my worries | 1 | 2 | 3 | 4 | 5 |
| 24. I have someone on whom I can depend when I am having problems with exercising | 1 | 2 | 3 | 4 | 5 |
| 25. I have a healthy friend who encourages me to exercise when I don't feel up to it | 1 | 2 | 3 | 4 | 5 |
| 26. I have someone that points out my reasons for not exercising | 1 | 2 | 3 | 4 | 5 |
| 27. I have someone that provides feedback about my exercising | 1 | 2 | 3 | 4 | 5 |
| 28. I reward myself when I exercise | 1 | 2 | 3 | 4 | 5 |
| 29. I try to set realistic goals for my exercise rather than setting myself up for failure by expecting too much | 1 | 2 | 3 | 4 | 5 |
| 30. When I exercise, I tell myself that I'm being good to myself by taking good care of my body in this way | 1 | 2 | 3 | 4 | 5 |
| 31. I do something nice for myself for making efforts to exercise more | 1 | 2 | 3 | 4 | 5 |
| 32. I tell myself I am able to keep exercising if I want to | 1 | 2 | 3 | 4 | 5 |
| 33. I tell myself that if I try hard I can keep exercising | 1 | 2 | 3 | 4 | 5 |
| 34. I make commitments to exercise | 1 | 2 | 3 | 4 | 5 |
| 35. I remind myself that I am the only one who is responsible for my health, and that I can decide whether or not I will exercise | 1 | 2 | 3 | 4 | 5 |

| | 1 Never | 2 | 3 | 4 | 5 Repeatedly |
|---|---|---|---|---|---|
| 36. I put things around my home to remind me of exercising | 1 | 2 | 3 | 4 | 5 |
| 37. I keep things around my place of work (school) that remind me of exercising | 1 | 2 | 3 | 4 | 5 |
| 38. I remove things that contribute to my inactivity | 1 | 2 | 3 | 4 | 5 |
| 39. I avoid spending long periods of time in environments that promote inactivity | 1 | 2 | 3 | 4 | 5 |

# APPENDIX I

**How confident are you that you could exercise regularly in each of the following situations. Please remember that regular exercise is defined as any planned, organized, and repetitive (continuous) physical exertion aimed at improving or maintaining aerobic or muscular physical fitness and health, and intense enough to work up a sweat and/or cause heavy breathing, and is participated in for at least 30 minutes, 3 times or more per week.**

**How confident are you that you could exercise regularly:**

---

1. When you are tired.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

2. When you are in a bad mood.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

3. When you feel you don't have time.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

4. When you are on vacation.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

5. On the weekend, if you haven't already exercised at least 3 times that week.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

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6. When you don't have an exercise partner.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

7. When you have exams/ assignments due.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

8. When it is raining or snowing.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

9. When you lack motivation for exercise.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

10. When you don't have access to facilities.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| not at all confident | slightly confident | moderately confident | very confident | extremely confident |

# APPENDIX J

For this next question, we would like you to recall your average weekly exercise over the past two weeks. How many times per week on average did you do the following kinds of exercise over the past two weeks?

When answering these questions please:

< consider your average weekly exercise over the past two weeks.

< only count exercise that was done during free time (i.e., not occupation or housework).

< note that the main difference between the three categories is the intensity of the exercise.

< please write the average frequency on the first line and the average duration on the second line.

| | Times Per Week | Average Duration |
|---|---|---|
| a. STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) | _____ | _____ |
| (e.g., running, jogging, hockey, soccer, squash, cross country skiing, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training) | | |
| b. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) | _____ | _____ |
| (e.g., fast walking, baseball, tennis, easy bicycling, volleyball badminton, easy swimming, alpine skiing, popular and folk dancing) | | |
| c. MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) | _____ | _____ |
| (e.g., easy walking, yoga, bowling) | | |

# APPENDIX K

The following questions ask you about your intentions to exercise for the next two weeks. Please focus on what your current plans or goals are for exercise rather than what you think will actually happen. Please remember that vigorous exercise is defined as any planned, organized, and repetitive (continuous) physical exertion aimed at improving or maintaining aerobic or muscular physical fitness and health, and intense enough to work up a sweat and/or cause heavy breathing.

1. In the next two weeks, I plan to exercise:

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | once in a while | | every other day | | every day |

2. I intend to exercise at least 3 times per week for 30 minutes at vigorous intensity over the next two weeks.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| strongly disagree | moderately disagree | slightly disagree | | slightly agree | moderately agree | strongly agree |

3. Over the next two weeks, I intend to exercise vigorously at least ____ times per week for 30 minutes or more each session (Please use a number between 0 and 7).

## Appendix L

Please answer the following questions based on the information package that was provided to you.

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1. Did you learn any additional benefits of exercise that you did not previously know?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| no additional benefits | | very few additional benefits | | some additional benefits | | many additional benefits |

2. Did you learn any additional strategies/ techniques that would help you make vigorous exercise a more regular part of your lifestyle?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| no additional strategies | | very few additional strategies | | some additional strategies | | many additional strategies |

3. Did the manual change your beliefs about the importance of regular vigorous exercise?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all | | increased slightly | | increased moderately | | increased significantly |

4. Do you feel confident that you have the tools necessary to make your own exercise plan?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not very confident | | slightly confident | | moderately confident | | extremely confident |

5. Did you find the information presented useful?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| not at all useful | | slightly useful | | moderately useful | | extremely useful |

6. Please comment on the strengths and weakness of the information package that was provided to you.

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